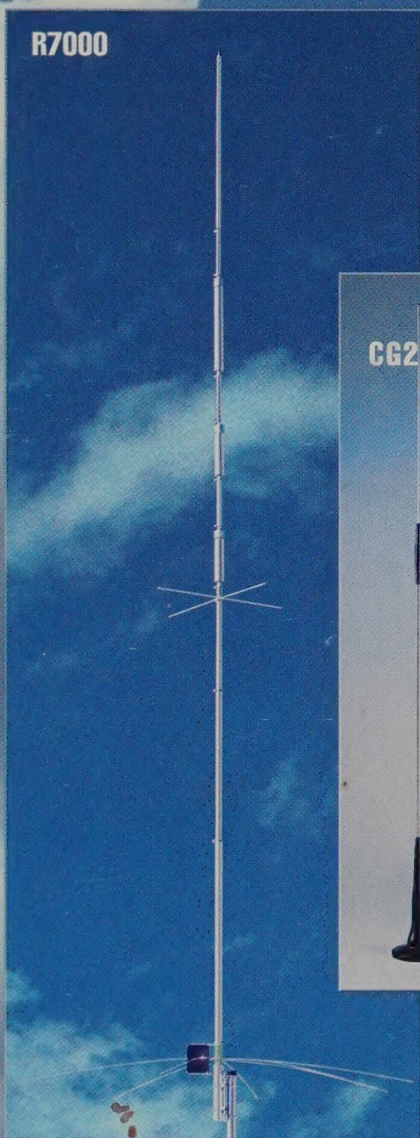




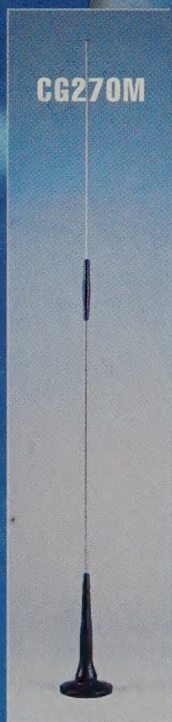
# cushcraft

C O R P O R A T I O N

R7000



CG270M



## AMATEUR RADIO ANTENNAS

### INTRODUCING R7000

10-40m, No Ground Radials,  
80m Add-On kit Available (p.1)

### NEW CUSHCRAFT GOLD

Style, Quality and Performance  
in a Dual Band Mobile (p.10)



MADE IN THE U.S.A.

A26



The all new R7000 is a 10 through 40 meter, no ground radial antenna that is expandable to include the excitement of 80 meters. It includes the best features of its predecessor the R7 plus many more. R7000 means excellent performance, easy installation and use, slim silhouette and high reliability.

## R80 Add-On Kit

80 meters can be easily added to the R7000 with the R80 kit. The kit includes a 40 meter trap, tubing, 80 meter loading coil, UV stable 400 lb. test guy rope and three 20 foot counterpoise wires that attach to your guy points. The R80 counterpoise wires were designed with state-of-the-art anti-resonators to ensure top performance on all bands. The R7000 with R80 kit is pictured to the far right.

- **EXPANDABLE TO 80M**

Transform your R7000 into an R7000+ with R80 kit (trap, tubing, guy & counterpoise wire)

- **RELIABLE**

New trap design is stable in all conditions

- **EASY INSTALLATION**

For typical use, tuning is not needed

- **AUTOMATIC BAND CHANGING**

To any band from 10 through 40m (80m with R80 kit)

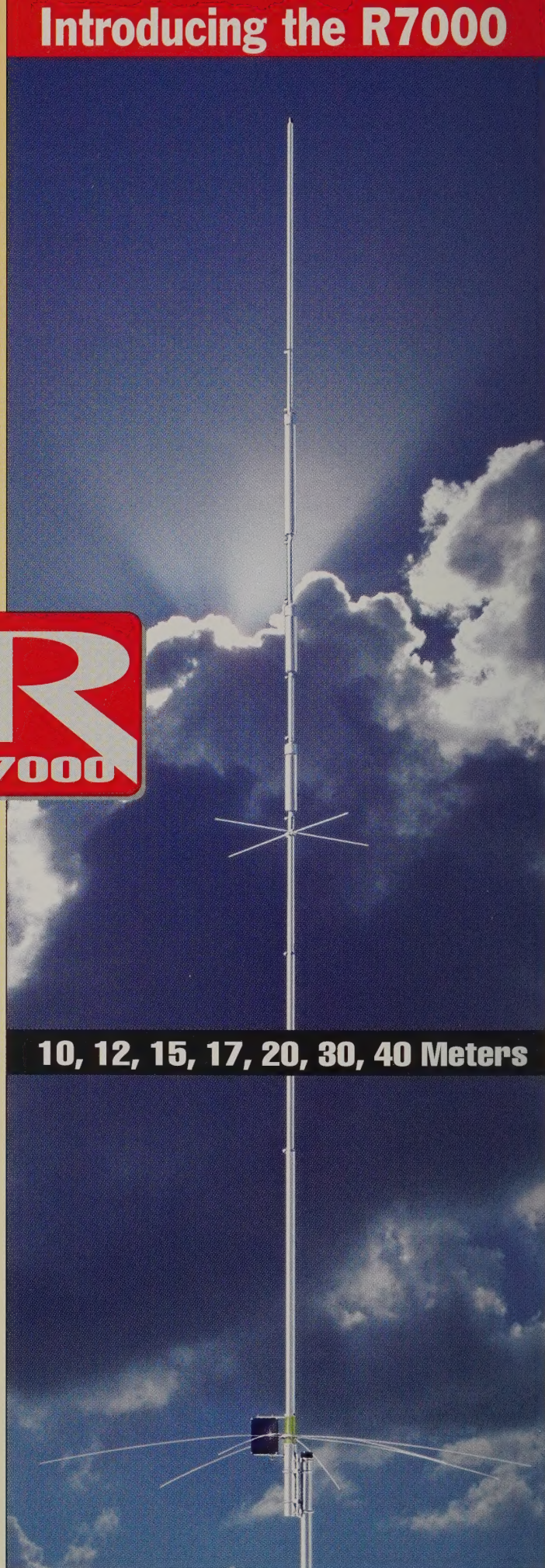
- **SLIM SILHOUETTE**

Gain favor of family and neighbors with the slim, smooth profile of our new trap design



**10, 12, 15, 17, 20, 30, 40 Meters**

MODEL	R7000	R7000+ (w/R80 kit)
Frequency, meters	10,12,15,17, 20,30,40	10,12,15,17 20,30,40,80
Gain, dBi	3	3
Wavelength each bd	Half-wave	Half-wave
VSWR	1.2:1 typical	1.2:1 typical
2:1 bandwidth, KHz	10m (1700)	10m (1700)
	12m (100)	12m (100)
	15m (450)	15m (450)
	17m (100)	17m (100)
	20m (250)	20m (250)
	30m (100)	30m (100)
	40m (150)	40m (100) 80m (70)
Power Rating, Watts	1500	1500
Radiation angle, deg.	16	16
Horizontal rad, deg	360	360
Height, ft(m)	24 (7.3)	34.5 (10.5)
Mast size range, in (cm)	1-3/4 to 2-1/8	1-3/4 to 2-1/8
	(4.4-5.4)	(4.4-5.4)
Wind load, ft <sup>2</sup> (m <sup>2</sup> )	2 (0.2)	2.5 (.23) antenna 1.5 (.139) guys
Weight, lb. (kg)	18 (8.2)	24 (10.8)





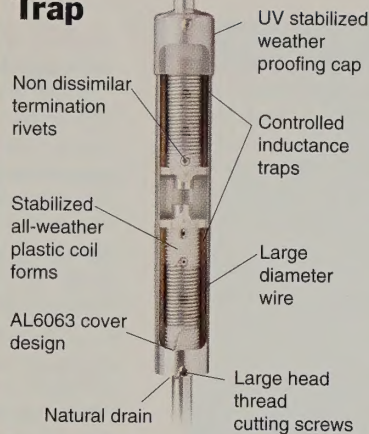
# R7000+ (with 80m Kit)

Here's what some of the very first R7000 users have to say.

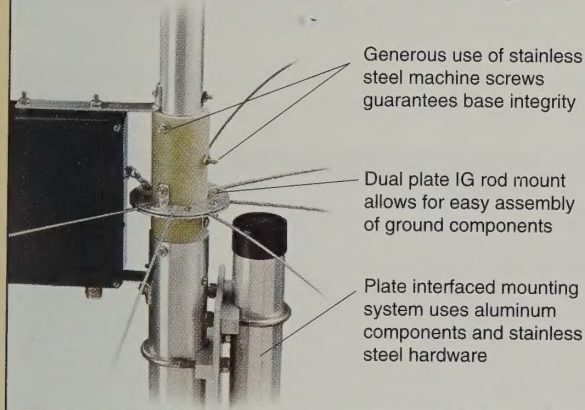
"The antenna is well built. The instructions are very clear with very helpful diagrams . . . Seven bands right out of the box with no tuning is impressive. . . I really like the construction of this antenna, no loose lockwashers to chase around. All stainless steel hardware is top notch. Keep up the good work." WVØH

"The R7000 experienced several hours of 50 mph sustained wind with gusts 70 plus mph. I used the R7000 during this time and noticed no difference in performance . . . I was surprised by being able to easily work western European and western African stations on 17m (from North Dakota)" WBØOAJ

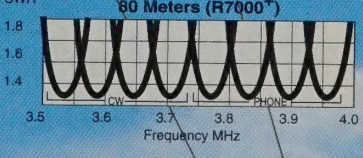
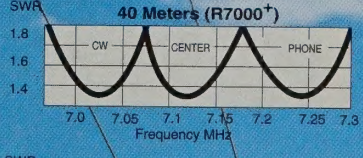
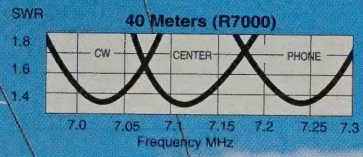
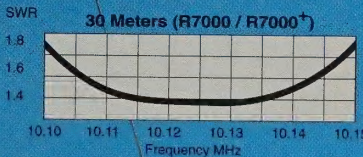
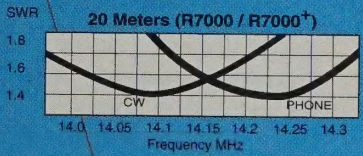
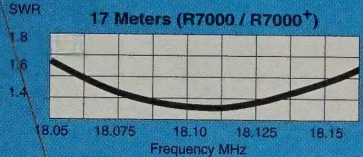
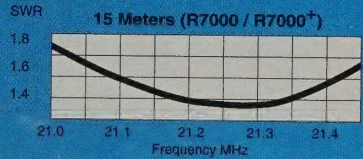
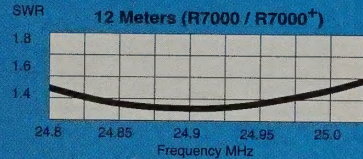
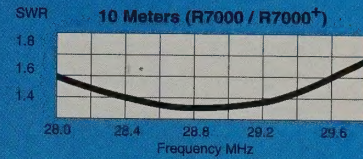
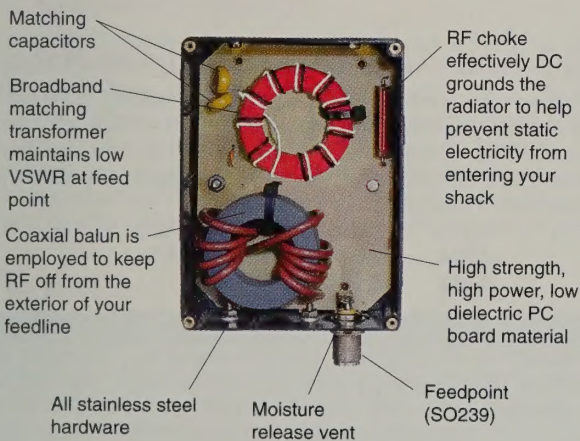
## R7000 Trap



## R7000's Rugged Design



## R7000 Matcing Network



10, 12, 15, 17, 20, 30, 40, 80 Meters



Cushcraft Corporation, Manchester, NH



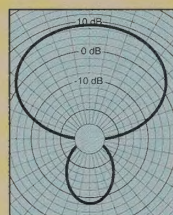
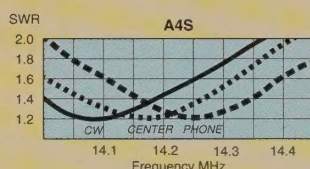
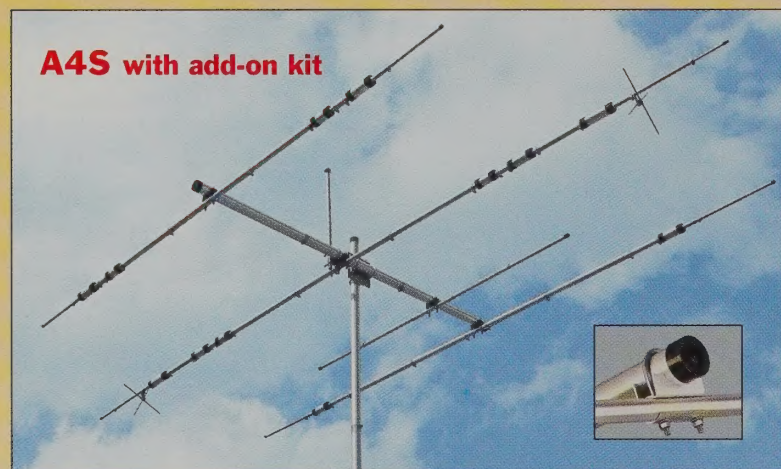
# World Ranger Multiband HF Yagis

## 10, 15, 20, 40 Meters

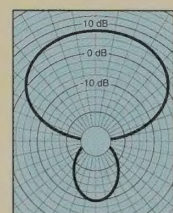
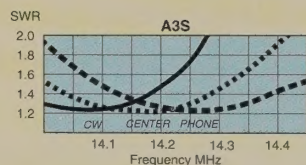
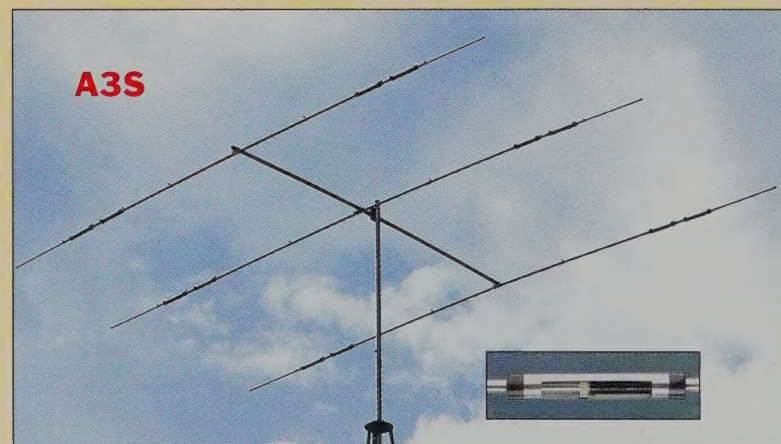
### Cushcraft Tribanders Make More DX Fun!

Our three and four element tribanders provide the versatility and performance that you need for reliable communication around the world. And they last! Cushcraft's World Rangers are made with 6063-T832 aluminum tubing, weatherproof traps, and fiberglass insulators to stand up to the weather. Our World Rangers have 50 Ohm twin terminal connectors and need no balun. They are designed with fewer parts for easier assembly, lower weight and less windload. You will spend your time in the shack, not on the tower!

Ham radio is a lot more fun when you have a dependable antenna like our World Ranger. Make your choice from our A4S, A3S and A3WS models. Add a 30 or 40 meter kit to make your antenna even more versatile!



A4S  
RADIATION  
PATTERN



A3S  
RADIATION  
PATTERN

### A4S Four Element Beam

**With stainless steel hardware.**

The A4S is the true, high performance tribander. Precisely tuned high-power traps, carefully selected element lengths, and proper spacing combine to make the A4S the preferred antenna for your contest work! This is the premium antenna with all the features that you want. High gain, low SWR, and wide bandwidth keep the contacts coming in. All U-bolts, clamps and hardware are stainless steel. The A4S has pinned boom sections and formed aluminum brackets to keep elements straight under all conditions. And our solid construction keeps the A4S on the tower!

### A3S Three Element Beam

**With stainless steel hardware.**

The A3 World Ranger, our top selling tribander, has become the A3S with all stainless steel hardware. It's a real power-house in a small space and lets you work the pile-ups with confidence. All you need is a lightweight tower and rotator to enjoy the benefits of the A3S. It's a proven performer in DX-peditions and contests and handles full power from your linear. Construction features include pinned boom sections, heavy duty element clamps with backing plates plus all stainless steel hardware.

When space is at a premium, but you want the benefits of a full-size tribander, the A3S is right for you!

MODEL	A4S	A3S
Frequency, MHz	28, 21, 14	28, 21, 14
No. Elements	4	3
Forward Gain, dBd	8.9	8
Front to Back Ratio, dB	25	25
SWR 1.2:1 Typical		
2:1 Bandwidth KHz	>500	>500
Power Rating, Watts PEP	2000	2000
3 dB Beam Width, Deg. E Plane	58	60
Boom Length, ft (m)	18 (5.48)	14 (4.27)
Boom Diameter, in (cm)	2 (5.10)	1.5 (3.81)
Longest Element, ft (m)	32 (9.75)	27.75 (8.45)
Element Center Dia, in (cm)	1.25 (3.18)	1.25 (3.18)
Turning Radius, ft (m)	18.4 (5.49)	15.5 (4.72)
Mast Size Range, in (cm)	1.25-2.00 (3.18-5.08)	1.25-2 (3.18-5.08)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	5.50 (0.51)	4.36 (0.47)
Weight, lb (kg)	37 (16.8)	27 (12.9)

### 30 and 40 Meter Add-On Kits

40 meters will come alive by adding one of these kits to the dipole of your A3S or A4S. The kits include high power traps with heavy wall fiberglass insulator and all hardware. A simple adjustment allows 30 meter operation. For our newest beam, the A3WS, we have a 30 meter add on kit the A103.

- A743** 7 MHz/10 MHz kit for A3S
- A744** 7 MHz/10 MHz kit for A4S
- A103** 10 MHz kit for A3WS

MODEL	A743/A744	A103
<b>BAND</b>	7 MHz (40 m) 10 MHz (30 m)	10 MHz (30 m)
Driven Element with Adapter kit, ft (m)	33.19 min. 35.33 max. (10.12-10.77)	27.12 min. 28.4 max. (8.27-8.66)
Windloading ft <sup>2</sup> (m <sup>2</sup> )	.58 (.05)	.27 (.03)
Bandwidth, KHz	125	150
Power Rating, Watts	2000 PEP	2000 PEP
Side Rejection, dB	20	20
Weight, lb (kg)	3.44 (1.56)	2.29 (1.04)



## 10 through 20 Meters



### Skylog

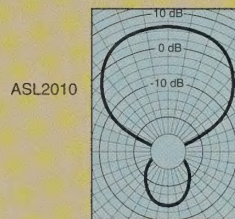
- Continuous five band coverage from 13.5 to 32 MHz
- Constant gain over entire frequency range
- 6.4 dBd gain, 65 degree beamwidth
- High efficiency design, antenna stays cool and VSWR steady
- 18 foot boom and 19.5 foot turning radius

This all new log periodic antenna is the most cost effective, high gain, five band antenna solution on the market today. Skylog offers continuous operation from 13.5 to 32 MHz. Antenna gain and beamwidth are constant for uniform coverage from 10 through 20 meters. The ASL2010 is rated for continuous duty at full legal power. Skylog is designed for maximum gain on a manageable 18 foot boom with only 10.1 square feet of wind surface area. All stainless steel hardware and rugged element design are only some of the many features that provide years of superior antenna performance. Skylog ASL2010 is the smart choice for multiband HF operation.

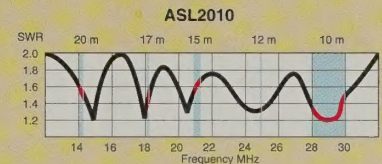


**ASL2010**

MODEL	A3WS	ASL2010
Frequency, MHz	24, 18	13.5-32
No. Elements	3	8
Forward Gain, dBd	8.0	6.4
Front to Back Ratio, dB	25	15-20
SWR 1.2:1 Typical		
2:1 Bandwidth	300 KHz	18.5 MHz
Power Rating, Watts	2000 PEP	2000
3 dB Beam Width, Deg. E Plane	60	65
Boom Length, ft (m)	14 (4.27)	18 (5.48)
Boom Diameter, in (cm)	1.50 (3.81)	2.0 (5.08)
Longest Element, ft (m)	25.1 (7.66)	38 (11.58)
Element Center Dia, in (cm)	1.25 (3.18)	1.25 (3.18)
Turning Radius, ft (m)	14.4 (4.4)	19.25 (5.86)
Mast Size Range, in (cm)	1.25-2 (3.18-5.08)	1.5-2 (3.18-5.08)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	4.1 (.38)	10.1 (.93)
Weight, lb (kg)	22.5 (10.2)	55 (25.5)



ASL2010



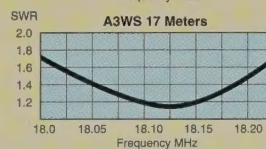
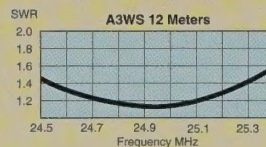
ASL2010

### A3WS WARC Bands 3 Element Beam

Enjoy the excitement of our newest HF bands with this all new beam. The A3WS gives full performance on 12 and 17 meters. With the addition of our easy-to-use A103 add on kit, it will also cover 30 meters. A3WS needs only a lightweight tower and rotator or you can mount it above an existing tribander. Construction features include pinned boom sections, heavy duty element clamps with backing plates plus all stainless steel hardware. Take charge of 12, 17 and 30 meters with the new A3WS.



**A3WS**



**D3W**

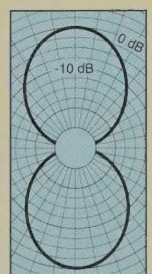
### Rotatable Dipoles

Our World Ranger Dipoles give bi-directional patterns and rotatable convenience. You can mount them high and away from the trees for better performance than a wire dipole. These single and multi-band dipoles feature high-performance traps, heavy wall tubing, and rugged hardware for years of enjoyment.

### D3W World Ranger Dipole

The perfect answer for the WARC bands. This rotatable dipole is easily mounted on the same mast as your existing tri-bander or other antennas. With a bi-directional pattern it will give you amazing performance on the new bands.

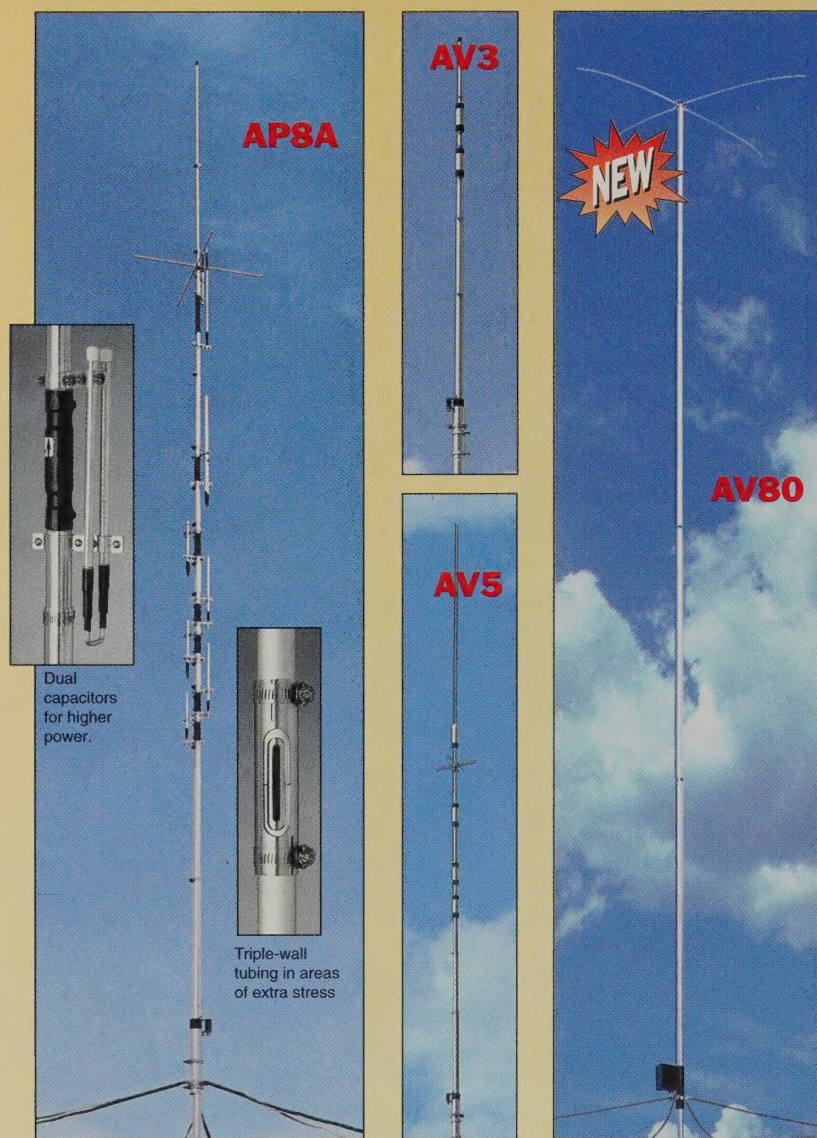
MODEL	D40	D4	D3	D3W
Frequency, MHz	7	28,21,14,7	28,21,14	24,18,10
SWR 1.2:1 Typical				
2:1 Bandwidth, KHz	200	>350	>500	>200
Power Rating				
Watts PEP	2000	2000	2000	2000
Length ft (m)	42.25 (12.88)	35.8 (10.92)	25.8 (7.86)	34.0 (10.37)
Mast Size, in(cm)	1.5-2 (3.8-5)	1.5-2 (3.8-5)	1.5-2 (3.8-5)	1.5-2 (3.8-5)
Wind Load, ft2 (m2)	1.3 (.12)	1.3 (.12)	.9 (.08)	.9 (.08)
Weight, lb (kg)	12 (5)	13 (6)	9 (4)	11 (5)



Typical Dipole Radiation Pattern



Limited space or budget? Want a low angle of radiation for more DX contacts? Consider using a Quarterwave vertical. These antennas require a good ground system, usually created with radials. The resulting antenna system gives you the most HF bang for the buck. If you want to cover several bands, the AP8A, AV5 or AV80 is the answer. To improve your stations performance on 75/80 meters, use the AV80. With any of these models, excellent DX will be yours within hours.



80 Meter, AP8A, AV3 AND AV5 REQUIRE RADIALS

MODEL	AP8A	AV80
Frequency, MHz	28, 24, 21, 18, 14, 10, 7, 3.5	3.5
Electrical Wavelength	1/4	1/8 wavelength to top hat
SWR 1.2:1 Typical		
2:1 Bandwidth	Full Band Except 40M>150 KHz & 80 M>80 KHz	With proper ground
Power Rating, Watts PEP	2000	1500
Radiation Angle, degrees	18	18
Horizontal Radiation Pattern, degrees	360	360
Height, ft (m)	26 (7.92)	36 (10.97)
Mast Size Range, in (cm)	1.5-1.75 (3.8-4.4)	1.5-1.75 (3.8-4.4)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	1.7 (.16)	4.2 (.42)
Weight, lb (kg)	9.5 (4.3)	20 (9.1)
Radials Required	Normally	Normally
Radial Kit Available	Yes, APR18A	APR80A

### NEW 80 Meter Vertical

For a special antenna on 75 and 80 meters, consider the NEW Cushcraft AV80. This time tested design features a top loading coil and a four element capacitive top hat. The radiator is 36 feet (10.9 M) long and 2 inches (5 cm) O.D. Its matching network allows immediate QSY'ing from the DX phone band to the DX CW band. Or, it could be set entirely in either the phone band or the CW band. The AV80 will take all the power you want to feed it. The matching network components are overrated to operate up to 1500 Watts. The AV80 is designed to match impedances with up to 5 Ohms of ground loss. It works well with 4 radials elevated 8 to 10 feet (2.4-3 M) off the ground or 16 quarterwave radials if ground mounted. Ground mounting the antenna would require a more extensive radial system. AV80 is an excellent choice for multi-element arrays.

### AP8A, Eight Bands In One Tough Antenna

The AP8A is the next generation eight-band quarterwave that has been strengthened with thick wall tubing, up to three layers deep in some sections, and high tensile strength fiberglass. The traps have been beefed up to handle the legal limit and are moisture sealed. You can be up and running on 10 through 80 meters in no time. (The APR-18A Radial Kit will make the job even easier.) The key to the AP8A's eight band coverage is the automatic bandswitching and efficient traps. The traps are parallel LC circuits which allow broadband operation. The AP8A is a very popular antenna with new hams because it's such a great value. Eight bands in one rugged antenna at an affordable price.

### APR18A Radial Kit

The Cushcraft APR-18A radial kit is the perfect match for the AP8A, AV3, AV5, or any quarterwave amateur HF vertical where a good low angle signal on the horizon and a low VSWR are important. The kit offers maximum performance on all HF bands and consists of only 9 multiple and single-conductor radials, with a maximum length of only 31 feet. It's great for quick installation at either ground level or rooftop sites.

### AV3 Three Band & AV5 Five Band

Our AV3 handles 10, 15, and 20 meters with fine performance and easy assembly. It has the same rugged construction as the AV5. The AV5 works with the popular 10, 15, 20, 40 and 80 meter bands with broad bandwidth and full legal power. For versatility, this is the antenna for you!

MODEL	AV3	AV5
Frequency, MHz	28, 21, 14	28, 21, 14, 7, 3.5
Electrical Wavelength	1/4	1/4
SWR 1.2:1 Typical		
2:1 Bandwidth	Full Band	Full Band except 80 M>70 KHz
Power Rating, Watts PEP	2000	2000
Radiation Angle, degrees	18	18
Frequency Selection	Automatic	Automatic
Horizontal Rad. Pattern, deg.	360	360
Height, ft (m)	14 (4.2)	25 (7.4)
Mast Size Range, in (cm)	1.5-1.75 (3.8-4.4)	1.5-1.75 (3.8-4.4)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	1.02 (.1)	1.89 (.19)
Weight, lb (kg)	5 (2.3)	8 (3.6)
Radials Required	Normally	Normally
Radial Kit Available	Yes, APR18A	Yes, APR18A



## 10, 15 Meters

### 10 Meters

The three element 10-3CD is a great selling antenna! If you have the space, and need the utmost in performance, then try our four element 10-4CD. You can't go wrong with these contest winners, especially if you are a Novice new to ten meters!

MODEL	10-4CD	10-3CD
Frequency, MHz	28.0-29.7	28.0-29.7
No. Elements	4	3
Forward Gain, dBd	10.0	8.0
Front to Back Ratio, dB	30	30
SWR 1.2:1 Typical		
2:1 Bandwidth, KHz	>900	>1400
Power Rating, Watts PEP	2000	2000
3 dB Beamwidth, Deg. E Plane	56	57
Side Lobe Attenuation, dB	40	40
Boom Length, ft (m)	16 (4.88)	10 (3.05)
Boom Diameter, in (cm)	2.0	1.63-1.50
	(5.08)	(4.1-3.8)
Longest Element, ft (m)	17.58 (5.34)	17.66 (5.38)
Element Center Dia, in (cm)	.88- .63	.88- .63
	(2.2-1.6)	(2.2-1.6)
Turning Radius, ft (m)	11.5 (3.5)	10 (3.05)
Mast Size Range, in (cm)	1.5-2.0	1.5-2.0
	(3.8-5.1)	(3.8-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	3.1 (.29)	2.3 (.21)
Weight, lb (kg)	18 (8.16)	11 (5.00)

### 15 Meters

These two monobanders will keep you enthusiastic about 15 meters. Our three element 15-3CD gives fine performance in limited areas. For maximum gain, select the four-element 15-4CD with its new 2" diameter boom. Or, try stacking two 15-4CD's for incredible performance! Reddi-match tuning makes it easy.

The 10dB forward gain of our 15-4CD is the result of computer design and will keep you the first in line during pileups!

MODEL	15-4CD	15-3CD
Frequency, MHz	21.0-21.45	21.0-21.45
No. Elements	4	3
Forward Gain, dBd	10.0	8.0
Front to Back Ratio, dB	30	30
SWR 1.2:1 Typical		
2:1 Bandwidth, KHz	500	500
Power Rating, Watts PEP	2000	2000
3 dB Beamwidth, Deg. E Plane	56	57
Side Lobe Attenuation, dB	>40	>40
Boom Length, ft (m)	20 (6.10)	14 (4.27)
Boom Diameter, in (cm)	2.0	2.0
	(5.08)	(5.08)
Longest Element, ft (m)	23.33 (7.11)	23.16(7.06)
Element Center Dia, in (cm)	1 (2.5)	1 (2.5)
Turning Radius, ft (m)	15.4 (4.72)	13.5 (4.11)
Mast Size Range, in (cm)	1.5-2.0	1.5-2.0
	(3.8-5.1)	(3.8-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	4.5 (.42)	3.4 (.32)
Weight, lb (kg)	25 (11.34)	20 (9.07)

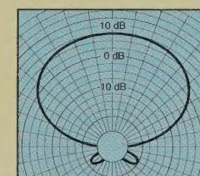
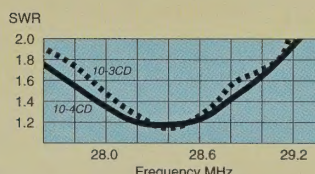
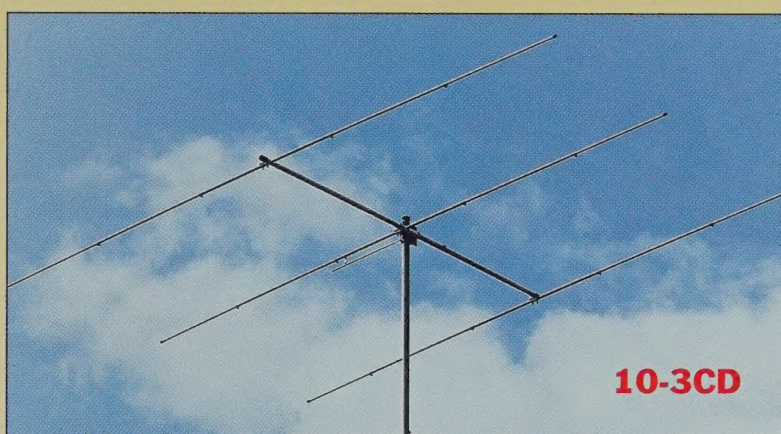
### More Performance Than You Ever Imagined

More contacts, less waiting, less interference, and a better signal at the other end are yours with Cushcraft monobanders!

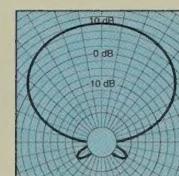
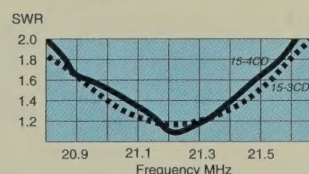
Computer-aided design helped us maximize forward gain while reducing sidelobes and SWR. Our 50 Ohm Reddi-match feed uses a UHF SO-239 for easy connection.

Construction features include improved larger diameter pinned booms with fewer sections, heavy-wall heat treated 6063-T832 aluminum tubing, stainless steel fasteners, worm drive element clamps, and carefully formed aluminum brackets.

Assembly is easy and installation can often be done by one person! Cushcraft monobanders are contest winners. One of these fine antennas is perfect for you.



Typical 3 Element Pattern



Typical 3 Element Pattern



## 10, 20, 40 Meters



### 40 Meters

The 40-2CD holds the North American contact record for 40 meters. A two element compact antenna, it has the performance that you want for 7 MHz work. The dipole center insulator is heavy duty with a twin terminal 50 Ohm connection. It is by far the most popular two element 40 meter beam!

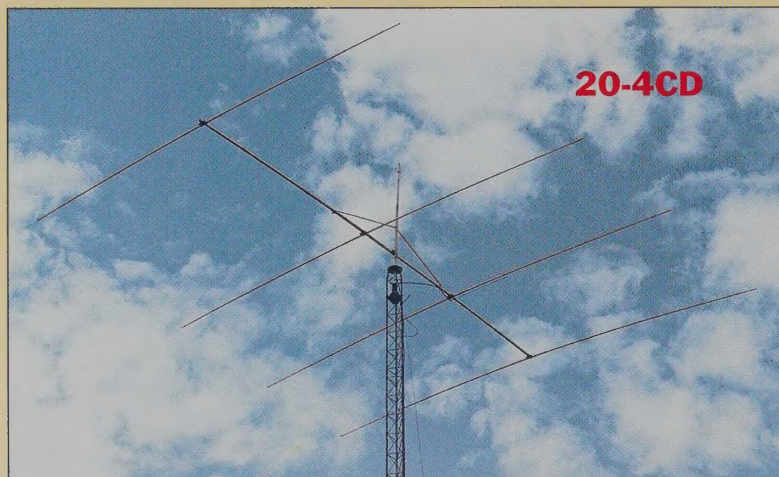
### 20 Meters

Our four element 20-4CD and the compact three element 20-3CD will punch your signal through the QRM.

Stainless steel fasteners and double U-bolt brackets ensure that your antenna will last for years.

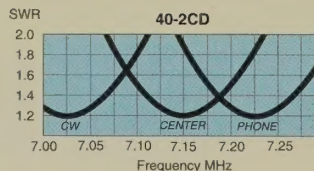
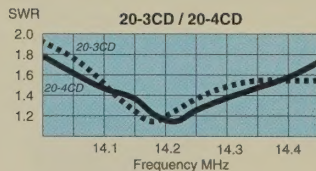
### 10 Meters TEN-3

Looking for a lightweight, economical alternative to the 10 meter big boys? Choose the TEN-3. Although it's popular with novices and technicians, this antenna is for any ham who wants more gain with a good front to back ratio on 10 meters. This antenna has an 8 foot boom making it easy to install on a very simple mount with only a lightweight rotator. The matching system is our proven Reddi-Match for 50 Ohm no balun feed and SO-239 connector. Make more positive contacts with the new TEN-3.



MODEL	40-2CD	TEN-3
Frequency, MHz	7.0-7.3	28-29.7
No. Elements	2	3
Forward Gain, dBd	5.5	8
Front to Back Ratio, dB	20	25
SWR 1.2:1 Typical		
2:1 Bandwidth, KHz	200	>1500
Power Rating, Watts PEP	2000	2000
3dB Beamwidth, Degrees		
E Plane	70	64
Side Lobe Attenuation	>40	>40
Boom Length, ft (m)	23(6.9)	8 (2.44)
Boom Diameter, in (cm)	2.13-1.88(5.4-4.8)	1.38-1.25(3.5-3.2)
Longest Element, ft (m)	43 (12.9)	18 (5.49)
Element Center Dia., in (cm)	1.25 (3.1)	.75 (1.9)
Turning Radius, ft (m)	23.93 (7.29)	9.8 (3.0)
Mast Size Range, in (cm)	1.5-2(3.8-5.1)	1.5-2(3.8-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	6.38 (.57)	2.0 (.20)
Weight, lb (kg)	44 (19.8)	9.9 (4.45)

MODEL	20-4CD	20-3CD
Frequency, MHz	14.0-14.35	14.0-14.35
No. Elements	4	3
Forward Gain, dBd	10.0	8.0
Front to Back Ratio, dB	30	30
SWR 1.2:1 Typical		
2:1 Bandwidth, KHz	>400	>300
Power Rating, Watts PEP	2000	2000
3dB Beamwidth, Degrees		
E Plane	56	57
Side Lobe Attenuation, dB	>40	>40
Boom Length, ft (m)	32 (9.75)	20 (6.1)
Boom Diameter, in (cm)	2.13-1.88(5.4-4.8)	2.0 (5.08)
Longest Element, ft (m)	36.08 (11.00)	35.95(10.96)
Element Center Dia., in (cm)	1.25 (3.1)	1.25 (3.1)
Turning Radius, ft (m)	23.75 (7.2)	20 (6.1)
Mast Size Range, in (cm)	1.5-2(3.8-5.1)	1.5-2(3.8-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	8.1 (.75)	5.5 (.51)
Weight, lb (kg)	55 (24.95)	30 (13.61)





## 2 Meters



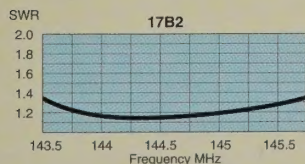
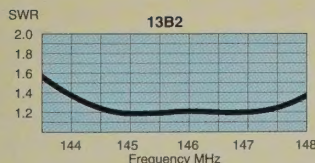
### 17B2 - 17 Element CW/SSB

The serious two meter operator who is interested in EME, aurora, scatter, SSB, CW, tropo etc, will choose the 17B2. It has 17 elements on a 4.5 wavelength boom. Our computer-aided design supported by precise test range data and the latest manufacturing technology gives you a cleaner pattern and 18 dBd gain in this long boom design. Significant enhancement is provided by the new UltraMatch balanced feed system with N-connector. The improved Boomer brace system is easier to install. 17B2 is a new stronger Boomer with a cleaner profile, less weight and wind load. All these features result in contest winning performance and more day to day operating enjoyment.

### 13B2 -13 Element Wideband

The new 13B2 is as versatile as the 17B2 is specialized. 13B2 will be your choice for high performance across the entire 2 meter band. New and experienced hams will enjoy 15.8 dBd gain on FM, packet, CW, or sideband across the 4 MHz operating range. The 13B2 is easily mounted vertically or horizontally for maximum performance on your favorite mode. Its optimum boom length makes it a popular antenna that fits just about anywhere. The new UltraMatch balanced feed on the 13B2 provides a 50 Ohm match via a standard SO-239 UHF female connector.

MODEL	13B2	17B2
Frequency, MHz	144-148	144-145
No. Elements	13	17
Forward Gain, dBd	15.8	18.0
Front to Back Ratio, dB	26	26
SWR 1.2:1 Typical		
2:1 Bandwidth, MHz	>4	>2
Power Rating, Watts PEP	2000	2000
3 dB Beamwidth, Degrees		
E Plane	2 x 18	2 x 14.5
H Plane	2 x 19	2 x 15
Side Lobe Atten., dB, E Plane	>60	>60
Boom Length, ft (m)	15 (4.57)	31 (9.45)
Electrical Wavelength	2.2	4.5
Longest Element, in (cm)	39.75 (101)	40.75 (103.5)
Turning Radius, ft (m)	8.9 (2.7)	17.25 (5.26)
Mast Size Range, in (cm)	(3.8-5.1)	(3.8-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	1.8 (.17)	3.9 (.36)
Weight, lb (kg)	6.7 (.31)	15.75 (7.14)



Boomers are easily stacked for more gain. See page 17 for details.

"The 13B2 was very easy to assemble. Very good instructions. High quality parts. A very neat looking antenna." (NM8T)

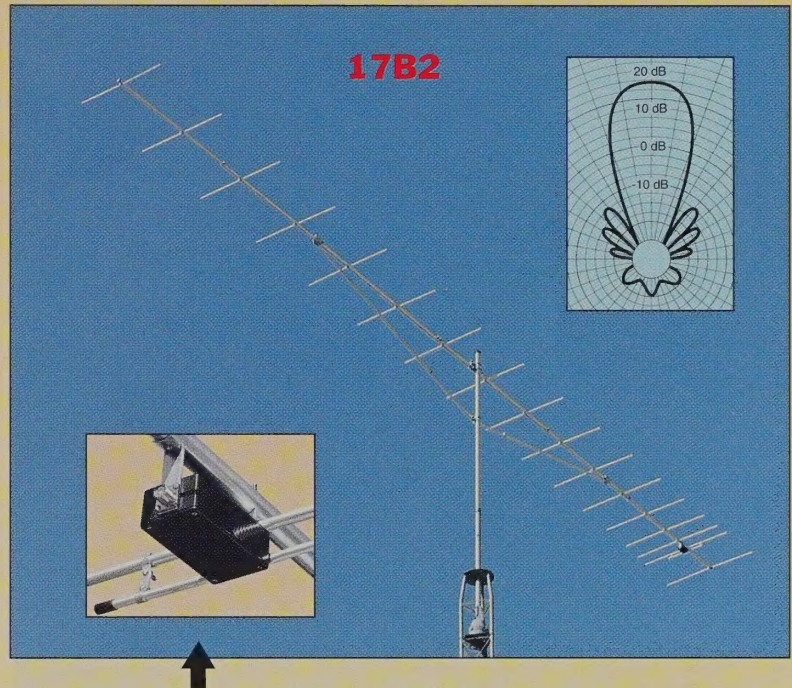
"Reliable contacts [on 13B2] to repeaters 100 miles using low power. Horizontally polarized 150 miles plus." (N9MHV)

"New 17B2 is nice improvement over 4218XL both mechanically and electrically." (VE3ASO)

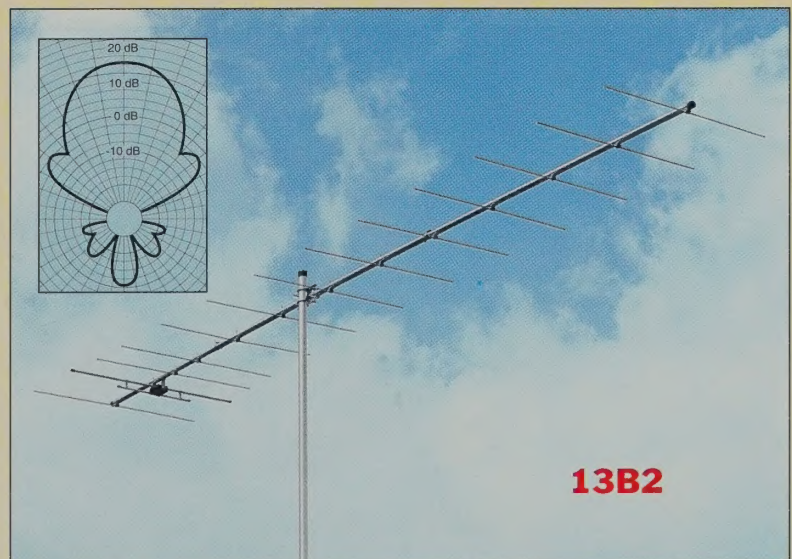
### The Boomer tradition continues.

New Boomers offer more gain and cleaner patterns with greater mechanical strength. New element spacings and lengths plus an improved feed system make it happen. Select from the 17B2 for the strongest signal on the low end of the band or the 13B2 for broadband performance across the band.

Cushcraft Boomers all feature solid rod elements, stainless steel hardware and very easy to follow assembly instructions. Simple tools and a little time are all that are needed for assembly. The new Boomer line will make your operating time more rewarding and enjoyable. Move up to the new Boomers today.

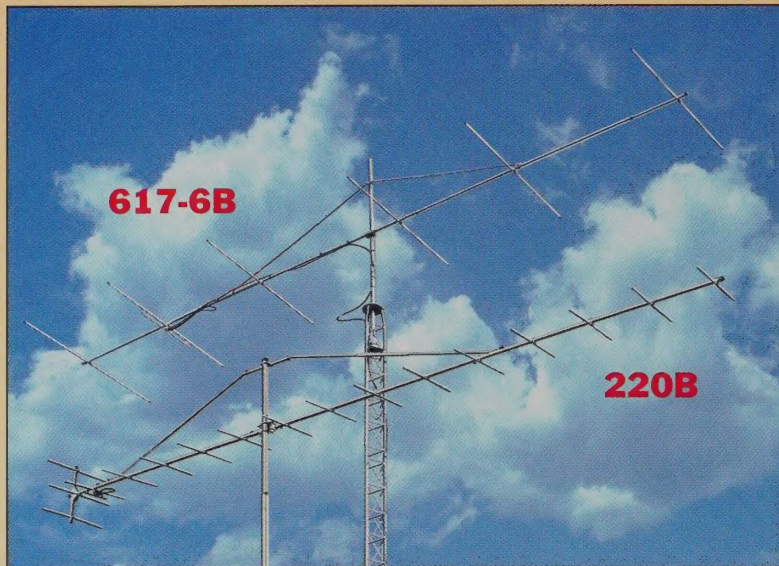


The new Cushcraft UltraMatch is a modified T-match system that provides a balanced current distribution on your Boomer. It uses UltraLink teflon® dielectric cable allowing for low loss high power applications. UltraMatch is completely enclosed for weather proofing. UltraMatch features an N-connector on the 17B2 and UHF SO239 on the 13B2. When all weather performance is important, you will choose the new UltraMatched Boomers everytime.





## 70 CM, 1 $\frac{1}{4}$ , 6 Meters



### Two NEW 70 CM Yagis

These new Cushcraft antennas are designed for easy assembly. The elements are mounted atop the boom with stainless traditional hardware. The feed systems employ a UM4N balun enclosed in a UV stabilized housing. The 719B uses a broadband folded dipole while the 729B utilizes a modified T-match.



### 1-1/4 Meters

We took the features of our 2 meter antennas and incorporated them into a high-gain 1-1/4 meter antenna that is perfect for this fast growing band. You will have more fun with Cushcraft!

### 6 Meters

Our 617-6B has more gain than any antenna in its class! The serious 6 meter operator will appreciate the features of this great performing Boomer. Find out for yourself.

MODEL	617-6B	220B
Frequency, MHz	50-51	222-223
No. Elements	6	17
Forward Gain, dBd	14.0	17.2
Front to Back Ratio, dB	30	30
SWR 1.2:1 Typical		
2:1 Bandwidth MHz	>1	>2
Power Rating, Watts PEP	2000	2000
3 dB Beamwidth, Degrees		
E Plane	2 x 19	2 x 13
H Plane	2 x 20	2 x 14
Side Lobe Atten., dB, E Plane	60	60
Boom Length, ft (m)	34 (10.36)	19 (5.8)
Electrical Wavelength	1.7	4.2
Longest Element, in (cm)	117 (297.2)	26 (66.2)
Turning Radius, ft (m)	17.7 (5.39)	9 (2.64)
Mast Size Range, in (cm)	1.5-2 (3.8-5.1)	1.5-2 (3.8-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	4.8 (.45)	2.6 (.24)
Weight, lb (kg)	26 (11.79)	10.5 (4.77)

### 719B FM, CW and SSB 15.5 dBd

Looking for an antenna to enhance performance on all modes of the 70 CM band? The 13.5 foot long 719B is the right choice. Mount it vertical for FM or horizontal for CW and Sideband. The 719B joins the 2 meter 13B2 as a classic for improved performance.

### 729B CW and SSB 17.8 dBd

This is the new leader in performance for 70 CM activity. Assembly is easy. Tuning is even easier with our modified T-matching network. The modified-T allows for increased bandwidth over conventional T-matches. It includes capacitive elements which allow for more adjustment. Teflon® cable is used for power efficiency. The non-drooping boom does not require a support strut. Mount several in an array for increased gain.

MODEL	719B	729B
Frequency, MHz	430-450	430-440
No. Elements	19	29
Forward Gain, dBd	15.5	17.8
Front to Back Ratio, dB	25	25
SWR 1.2:1 Typical		
2:1 Bandwidth MHz	20	>10
Power Rating, Watts PEP	2000	2000
3 dB Beamwidth, Degrees		
E Plane	24	20
H Plane	19	22
Side Lobe Atten., dB, E Plane	60	60
Boom Length, ft (m)	13.5 (4.1)	22.17 (6.75)
Electrical Wavelength	6	9.8
Longest Element, in (cm)	13.75 (34.9)	13.75 (34.9)
Turning Radius, ft (m)	7.25 (2.2)	12.5 (3.8)
Mast Size Range, in (cm)	1.25-2 (3.2-5.1)	1.25-2 (3.2-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	1.2 (.11)	2.2 (.21)
Weight, lb (kg)	5.6 (2.55)	8.6 (3.9)



## 1 1/4, 2 Meters

### 13B2 - 13 Element Wideband

Boomer evolution continues with the 13B2. This new design is lighter weight, lower profile and has more gain and a cleaner pattern. New technicians and experienced hams will enjoy 15.8 dBd gain on FM, packet, CW, or sideband. 13B2 is easily mounted vertically for greatest FM distance and enjoyment. Its optimum boom length makes it a popular antenna that fits almost anywhere. The new balanced UltraMatch provides a 50 Ohm UHF connector for easy feedline attachment. Stronger performance in the 215WB tradition will be yours with the 13B2.

### 124WB - 4 Element Wideband

This is the right choice for packet systems and other applications requiring a dedicated directional antenna.

*All of these antennas give you hot performance with light weight and minimum windload. Stainless steel hardware, solid rod elements and hard drawn aluminum tubing assure you that the antenna will last.*

MODEL	124WB	13B2	26B2
Frequency, MHz	144-148	144-148	144-148
No. Elements	4	13	26
Forward Gain, dBd	10.2	15.8	18.8
Front to Back Ratio, dB	19	26	26
SWR 1.2:1 Typical			
2:1 Bandwidth, MHz	>4	>4	>4
Power Rating, Watts PEP	2000	2000	2000
3dB Beamwidth, Degrees			
E Plane	60	2x18	2x18
H Plane	88	2x19	2x9.5
Side Lobe Attenuation, dB, E Plane	40	>60	>60
Boom Length, ft (m)	4 (1.22)	15 (4.57)	15 (4.57)
Electrical Wavelength	.5	2.2	2.2
Longest Element, in (cm)	40.75 (104)	39.75 (101)	39.75 (101)
Turning Radius, ft (m)	4 (1.22)	8.9 (2.7)	10.4 (3.18)
Mast Size Range, in (cm)	1.25-2 (3.2-5.1)	1.5-2 (3.8-5.1)	1.5-2 (3.8-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	.34 (.034)	1.8 (.17)	4.84 (.45)
Weight, lb (kg)	3 (1.36)	6.7 (.31)	21.5 (9.75)

MODEL	224WB	225WB
Frequency, MHz	222-225	222-225
No. Elements	4	15
Forward Gain, dBd	10.2	15.5
Front to Back Ratio, dB	24	24
SWR 1.2:1 Typical		
2:1 Bandwidth, MHz	>5	>5
Power Rating, Watts PEP	2000	2000
3dB Beamwidth, Degrees		
E Plane	60	2x17
H Plane	88	2x19
Side Lobe Attenuation, dB E Plane	40	60
Boom Length, ft (m)	3 (.91)	10 (3.05)
Electrical Wavelength	0.5	2.2
Longest Element, in (cm)	26.7 (68)	26.3 (67)
Turning Radius, ft (m)	3 (.91)	5.8 (1.78)
Mast Size Range, in (cm)	1.25-2 (3.2-5.1)	1.25-2 (3.2-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	.23 (.021)	.95 (.09)
Weight, lb (kg)	1.7 (.77)	5.25 (2.4)

**13B2**



**124WB**



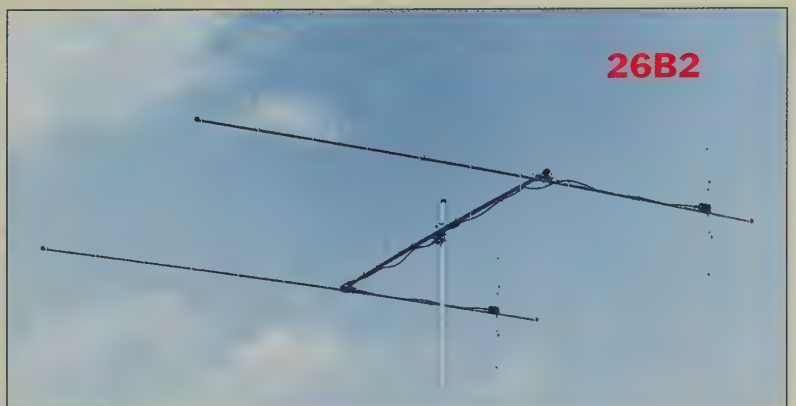
### 224WB/225WB - 220 MHz Widebands

Perfect for the novice phone band and other 220 MHz operation.

### 26B2 - 26 Element Wideband

This antenna offers the highest gain of any 2 meter FM antenna in the world. Select the 26B2 when you need to work repeaters or simplex over extreme distances.

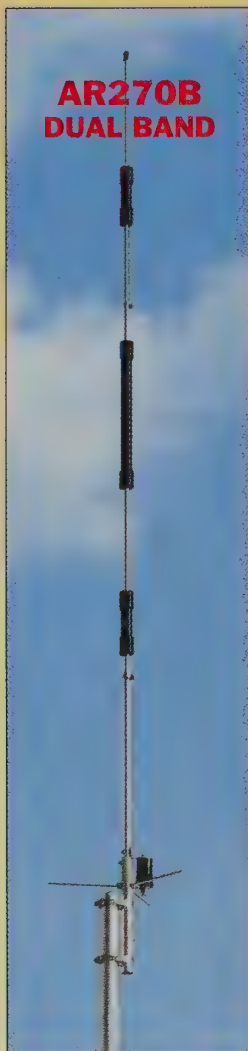
**26B2**





## 70 CM, 2 Meters

### AR270B DUAL BAND



### AR270B 5.5/7.5 dB Dual Band Ringo

This all new model gives very high gain with a low angle of radiation and it is only 7.7 feet (2.35 m) high. The AR270B is computer optimized with two 5/8 wavelength collinear elements on 2 meters and four 5/8 wavelength elements on 70 cm. It is broadbanded for minimum SWR on both bands. It is easy to assemble with three rugged aluminum tubing sections, a durable mast mount and factory sealed coils for best performance.

MODEL	AR270		AR270B	
Frequency, MHz	144-148	430-450	144-148	430-450
SWR 1.2:1 Typical				
2:1 Bandwidth, MHz	>4	>15	>4	>15
Gain, dB	3.7	5.5	5.5	7.5
Power, Watts FM	250	250	250	250
Horizontal Radiation				
Pattern, Degrees	360	360	360	360
Height, ft, (m)	3.75 (1.13)		7.7 (2.3)	
Mast Size Range, in	1.25-2 (3.2-5.1)		1.25-2 (3.2-5.1)	
Radial Length, in (cm)	6.75 (17.1)		6.75 (17.1)	
Wind Load, ft2 (m2)	0.27 (0.03)		0.47 (0.044)	
Weight, lb (kg)	2 (0.9)		2.4 (1.09)	

### All-American Dual Band Ringo

Cushcraft's new ARX270 high performance fiberglass base antenna yields a gain of 9 dB on VHF and 12 dB on UHF. Our exclusive non-metallic UV stabilized couplings result in the cleanest pattern of any dual band antenna. The radome is bright white, thick-wall fiberglass that will survive 90 mph winds. The three section design allows easy assembly and is U.P.S. shippable. Our sleek extruded base clamps eliminate vibration and they look great. Professional features like the factory installed pigtail feed and choice of UHF or N connector makes weather-proof connections easy. These technical innovations put the ARX270 miles ahead. The All-American Dual Bander comes factory tuned and does not require any adjustments. The ultimate in dual-band FM enjoyment can be yours with the ARX270.

### AR270 3.7 / 5.5 dB Dual Band Ringo

The "Dual Wonder" AR270 is only 3.75 feet (1.1 meters) high. It has great performance for its size, making it the most popular 2m/70 cm base antenna.

### AR270 DUAL BAND



### ARX270 DUAL BAND



ARX270U  
with UHF con

ARX270N  
with N con

## Introducing Cushcraft Gold!

### The Gold Standard in Mobile Design!

Style, Performance, and Price. Cushcraft selected an award winning industrial design firm to develop an aesthetically pleasing, unique profile for automotive travel in the 90's, and our RF design team engineered in new standards of quality, performance and features. We call it Cushcraft Gold. This slim-line, aerodynamic design antenna provides 5.5 dB on 440 and 3.7 dB on 2 meters. Cushcraft Gold starts with a solid brass base which is nickel plated, then powder coated to look and work like new for years. The base assembly is engineered to resist shock and vibration. A stainless steel spring and nickel plated base contact assure maximum RF transfer. The weather resistant rubber O-ring around the base, helps keep out moisture and provides for scratch free roof-mounting. Both the base matching network and the center phasing coil are housed inside temperature and shock-resistant Delrin®. The heavy duty stainless-steel whip will resist corrosion. We've even included a unique tilt-over feature so you don't have to remove the whip to enter a garage with a low ceiling. This is all the antenna you'll need for years of trouble-free communications. Available with Mag-mount or mount to existing 3/4" roof mount.

### CG270M DUAL BAND

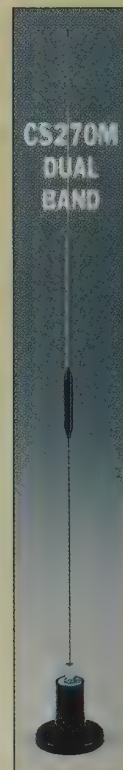


MODEL	ARX270U/N	
Frequency, MHz	144-148	430-450
SWR 1.2:1 Typical		
2:1 Bandwidth, MHz	>4	>20
Gain, dB	9	12
Power Rating, Watts FM	200	200
Horizontal Radiation		
Pattern, Degrees	360	360
Height, ft, (m)	16.5 (5)	
Mast Size Range, in	1.25-2 (3.2-5.1)	
Radial Length, in (cm)	20.5 (52.1)	
Wind Load, ft2 (m2)	0.95 (0.088)	
Weight, lb (kg)	5 (2.3)	

### CS270M 70 CM / 2M Mobile

The CS270M offers the most gain possible in its compact size. It has 5.5 dB on 440 and 3.7 dB on 2 meters all in a 36-1/2" tall design. The small coil is insert molded into the center of the radiator. No moisture can penetrate the coil with this technique. The magnetic mount features a clinging 90 pound pull and a roof-protecting rubber pad. The feed line is double shielded Teflon® UltraLink Cable.™ It is low-loss, high temperature and designed to last. The CS270M has all of the features you will need in a dual-band mobile antenna.

### CS270M DUAL BAND





# Ringo Ranger II & Dual Band Yagis

70 CM, 1 $\frac{1}{4}$ , 2 Meters



## Our Ringos are Number One.

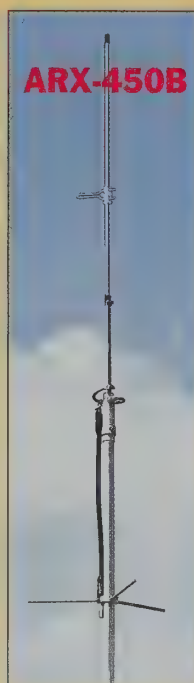
*Tough performers at a good price! The Ringo family of dependable, cost-effective antennas has served more hams - from novice to veteran extra - than any other amateur antenna made. Simple, straightforward design, light weight and quick, easy installation make the durable Ringo family right for you. Ringo's top performance and low cost mean more dB per dollar - an equation anyone can appreciate.*

## Ringo Ranger II

Our Ringo Ranger II has more gain, less windload, and more mechanical integrity than other two meter antennas. You'll quickly appreciate the benefits of this amazing antenna! Based on the original W1BX Ringo, the Ringo Ranger II is the latest design featuring three 5/8 wave radiating elements and an adjustable 1/8 wave phasing stub. The result is a very low angle of radiation over your coverage area.

The Ringo Ranger II has built-in lightning protection, UV-stabilized insulators, heavy wall tubing, improved decoupling radials to eliminate feedline radiation, and all-weather performance. The ARX-450BN has all the features of the standard antenna plus N-connector.

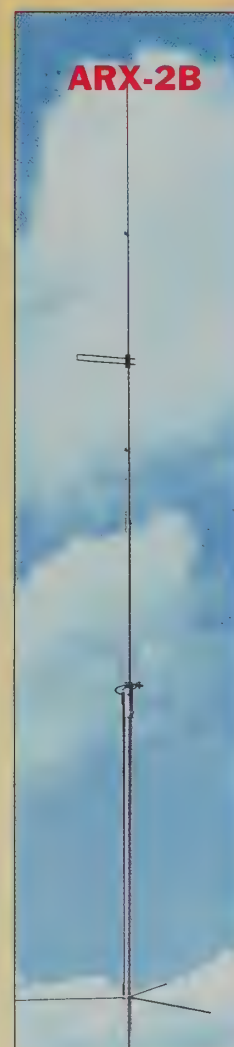
MODEL	ARX-2B	ARX-220B	ARX-450B
Frequency, MHz	135-160	222-225	435-450
SWR 1.2:1 Typical			
2:1 Bandwidth, MHz	>3	>5	>10
Gain, dB	7.0	7.0	7.0
Power Rating, Watts FM	1000	500	500
Radiation Angle, Deg.	7	7	7
Horizontal Radiation			
Pattern, Degrees	360	360	360
Ring Diameter, in (cm)	5 (12.7)	5 (12.7)	3.5 (8.9)
Radiator Base Dia, in (cm)	.75 (1.9)	.75 (1.9)	.50 (1.2)
Height, ft. (m)	14 (4.3)	9.3 (2.8)	4.9 (1.5)
Mast Size Range, in (cm)	1.0-1.25 (2.54-3.1)	1.0-1.25 (2.54-3.1)	.75-.88 (1.9-2.22)
Radial Length, in (cm)	20.5 (52.1)	13.75 (33.7)	6.75 (17.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	0.5 (0.05)	0.3 (0.03)	0.2 (0.02)
Weight, lb (kg)	6 (2.7)	5 (2.3)	1 (.45)



ARX-450B



ARX-220B



ARX-2B

### Some hams comment on the ARX-2B:

*"Since I put this antenna up I have received many compliments on the improvement of my signal." (N3LHP)*

*"The only antenna I ever installed that worked like it should the first time." (N7PGH)*

*"ARX-2B is a good antenna for my use on 2 meters FM...Several on the air in my area." (N9OPL)*

*"ARX-2B...the best antenna." (XE2CLB)*



## A270-10S and A270-6S 10 and 7.8 dB Dual Band Yagis

Increase your range by selecting one of the new Cushcraft dual band Yagis on 2 meters and 70 cm. You can point the antenna at stations while you are in QSO with them. This will direct more of your output power when transmitting at the same time reducing interference and increasing signal strength when receiving. These antennas are perfect for packet applications. Assembly is a snap with our



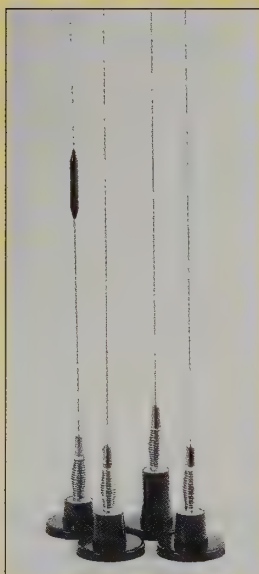
MODEL	A270-10S		A270-6S	
Frequency, MHz	144-148	430-450	144-148	430-450
No. Elements	5	5	3	3
Forward Gain, dBd	10	10	7.8	7.8
Front to Back Ratio, dB	20	18	20	18
SWR 1.2:1 Typical				
2:1 Bandwidth, MHz	≥4	≥10	≥4	≥20
Power Rating, Watts PEP	350	350	350	350
3dB Beamwidth, Degrees				
E Plane	52	52	66	66
H Plane	60	60	108	108
Boom Length, ft (m)	6.17 (1.9)		2.8 (.85)	
Longest Element, in (cm)	40.3 (102.4)		41 (104.1)	
Turning Radius, ft (m)	6 (1.8)		2.8 (.85)	
Mast Size Range, in (cm)	1.25-2		1.25-2	
	(3.2-5.1)		(3.2-5.1)	
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	.725 (.07)		.3 (.02)	
Weight, lb (kg)	1.8 (.81)		1.7 (.8)	

fully illustrated assembly manuals. The A270-10S has nearly twice the performance of the A270-6S. Select the antenna for your station depending on the distance of your contacts.

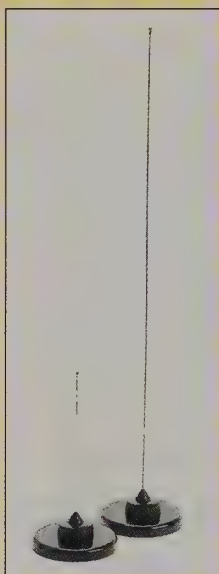


Cushcraft/Signals mobiles offer the high performance that you need for consistent and mobile communications such as commuting and public service activities. These antennas are the choice of hams and communications professionals around the world who demand high quality, premium products.

SEE YOUR LOCAL DEALER'S CUSHCRAFT MOBILE DISPLAY



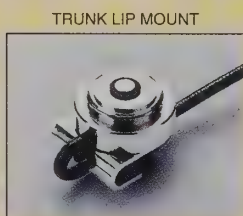
GAIN MOBILE ANTENNAS



QUARTERWAVE MOBILES



BLACK MAG MOUNT



TRUNK LIP MOUNT

UltraLink Cable™



### UltraLink™ Cable

Cushcraft UltraLink cable was designed specifically for high efficiency commercial mobile applications to 900 MHz. UltraLink's RG-58 size allows easy installation through the tightest openings, while its Teflon® dielectric provides the highest temperature tolerance to handle vehicle hot-spots that would melt other dielectric materials. Additional 100% shielding is provided by a jacket of easy-peel foil. All this is covered by 97% braid for easy, secure connector attachment. More of your signal will get through with UltraLink than with any other mobile cable.

### CS28M Ten Meter Mag-Mount

Work a new country while you wait for the light to change. Introduced just last year, the CS28M ten meter mag-mount has become a constant companion to today's popular 10 meter multimode mobile rigs. The CS28M comes complete, ready to go with a 49" stainless steel whip and spring and a Euro-Style black poly-coated 90 pound pull magnet. A heavy rubber pad protects your car's finish; twelve feet of Cushcraft's own UltraLink™ low-loss cable (specifically designed for commercial mobile applications to 900 MHz) and PL-259 connector are included with the CS-28M.

### Gain and Quarterwave Mobile Antennas

Cushcraft's years of commercial and amateur experience apply cutting-edge designs to consistently high quality materials to produce the best mobile antennas you can buy.

All inductors (and even the coil contacts) are silver plated for better RF conductivity, and all Cushcraft mobile hardware is brass to prevent the seizing inherent with inferior, dissimilar-metal joints. All Cushcraft mobile coil housings are ABS, impervious to temperature changes and ultraviolet radiation. Brass base threads, ultrasonically welded into coil housings, eliminate premature failures associated with inferior fastening techniques, and Cushcraft insert-molded 440 MHz phasing coils assure weather-tight integrity. Only Cushcraft mobile antenna mounts are entirely 50 Ohms, eliminating lossy "VSWR bumps" common in many well known designs. Cushcraft quarter-wave models (CS1147 and CS1450) are broadband, require no tuning and include UltraLink™ low loss cable.

### Magnetic Mounts

Cushcraft mag-mounts stay where you put them. Our 90 pound pull magnets are the strongest you'll find. Euro-style black poly finish protects against rust, and a tough rubber pad gives maximum protection to your vehicle's finish. Ultra-Link™ cable on all Cushcraft mobile antennas means more of your signal reaches your antenna every time you key the mike.

### NEW CS-270M Dual-Band Mobile

See page 10 for a full description of this new 70cm/ 2 meter mag-mount mobile.

Model No.	Frequency MHz	Whip Length In	Whip Length m	Description
CS-270M	144-148/440-450	34	.86	Magnetic
CS-270A	144-148/440-450	34	.86	Coil & Whip
CS-147M	144-174	49	1.25	Magnetic
CS-147T	144-174	49	1.25	Trunk Lip
CS-147	144-174	49	1.25	3/4" Hole
CS-147A	144-174	49	1.25	Coil & Whip
CS-1147M	144-148	20	.5	Magnetic
CS-220M	222-225	33	.84	Magnetic
CS-220T	222-225	33	.84	Trunk Lip
CS-220	222-225	33	.84	3/4" Hole
CS-450M	435-470	29.5	.75	Magnetic
CS-450T	435-470	29.5	.75	Trunk Lip
CS-450	435-470	29.5	.75	3/4" Hole
CS-1450M	430-450	7	.17	Magnetic
CS-50M	46-54	49	1.25	Magnetic
CS-50T	46-54	49	1.25	Trunk Lip
CS-50	46-54	49	1.25	3/4" Hole
CS-28M	28-30	49	1.25	Magnetic



70 CM, 1 $\frac{1}{4}$ , 2, 6, 10 Meters



## Ringo Ranger

### NEW ARX-6

The ARX-6 was developed to meet the needs of serious 6 meter FM hams. It has twice the gain of the standard AR-6. If your operating style requires the most gain and wide-area coverage from a repeater or home station, the ARX-6 is made for you.

### ARX-2

This is the 2 meter antenna that combines good gain with compact size. If space does not allow extra height or decoupling radials, the ARX-2 will do the job.

MODEL	ARX-6	ARX-2
Frequency, MHz	50-54	135-160
SWR 1.2:1 Typical		
2:1 Bandwidth, MHz	>4	>6
Gain, dB	5.5	5.5
Pwr Rating, Watts FM	1000	1000
Radiation Angle, Deg.	360	360
Horizontal Radiation		
Pattern, Degrees	360	360
Ring Diameter, in (cm)	13 (33)	5 (12.7)
Base Dia, in (cm)	2 (5.1)	1.5 (3.8)
Height, ft, (m)	24 (7.3)	9.3 (2.8)
Mast Range, in (cm)	1.5-1.75 (3.8-4.4)	1-1.25 (2.54-3.2)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	1.9 (.18)	.33 (.03)
Weight, lb (kg)	7.5 (3.4)	4 (1.8)

## Ringo

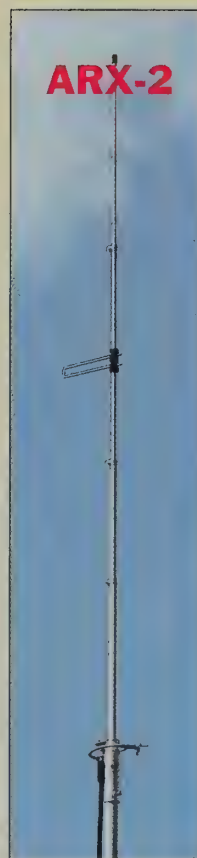
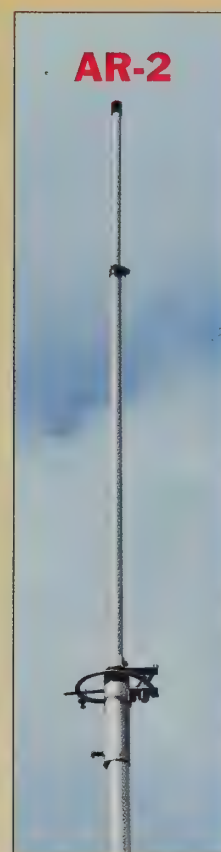
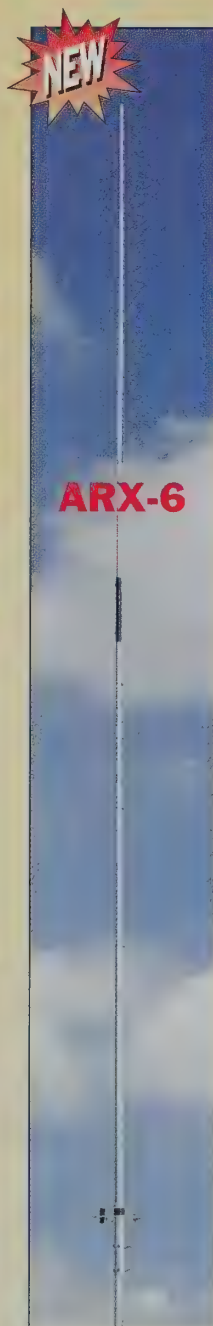
These are the original W1BX FM Ringos. If you want a combination of compact size, wide bandwidth, a low radiation angle, these economical antennas are just for you. Since radials are not needed, you can even use our Ringos indoors. Our Ringos are 1/2 wave and include built-in lightning protection. Put up one of these easily installed antennas and start enjoying FM!

MODEL	AR-2	AR-6	AR-10	AR-220	AR-450
Frequency, MHz	135-160	50-54	28-29.7	222-225	440-460
SWR 1.2:1 Typical					
2:1 Bandwidth, MHz	10	2	>1.5	10	20
Gain, dB	3.75	3.75	3.75	3.75	3.75
Power Rating, Watts FM	1000	1000	1000	500	500
Radiation Angle, Deg.	16	16	16	16	16
Horizontal Radiation					
Pattern, Degrees	360	360	360	360	360
Ring Diameter, in (cm)	5 (12.7)	13 (33)	13 (33)	5 (12.7)	3.5 (8.9)
Radiator Base Dia, in (cm)	.75 (1.9)	1 (2.5)	1 (2.5)	.75 (1.9)	.5 (1.3)
Height, ft, (m)	3.9 (1.2)	10.1 (3.1)	17.6 (5.36)	2.6 (.78)	1.4 (.43)
Mast Size Range, in (cm)	1-1.25 (2.54-3.1)	1-1.25 (2.54-3.1)	1-1.25 (2.54-3.1)	1-1.25 (2.54-3.1)	.75-.88 (1.9-2.22)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	.21 (.02)	.37 (.03)	1.68 (.16)	.21 (.02)	.1 (.01)
Weight, lb (kg)	1.5 (.68)	2.5 (1.1)	4 (1.8)	1.2 (.55)	1 (.45)

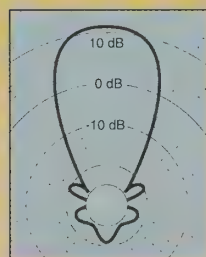
## Four Pole Arrays

Cushcraft's four 1/2 wave dipole array is perfect for your repeater or as a powerful base antenna. Strong through-the-boom dipole mounting ensures long life and superior electrical characteristics. The dipoles mount to your tower's legs or on a separate support mast (not included). They can be arranged for omni or elliptical patterns.

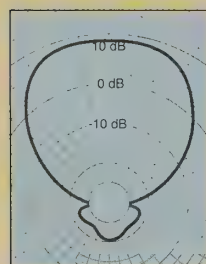
MODEL	AFM-4DA	AFM-24DA	AFM-44DA
Frequency, MHz	144-148	222-225	435-450
Gain, dBd	9 Offset 6 Omni	9 Offset 6 Omni	9 Offset 6 Omni
SWR 1.2:1 Typical			
2:1 Bandwidth, MHz	>4	>5	>15
Power Rating, Watts FM	500	500	250
Radiation Angle Degrees	6	6	6
Horizontal Radiation			
Pattern, Degrees	360-Variable	360-Variable	360-Variable
Height, ft (m)	23 (7.0)	15 (4.5)	8 (2.4)
Mast Size Range, in (cm)	1.5-2.0 (3.8-5.1)	1.5-2.0 (3.8-5.1)	1.25-2.0 (3.2-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	2.54 (.24)	1.85 (.17)	1.13 (.11)
Weight, lb (kg)	7 (3.2)	6 (2.7)	5 (2.3)







A148-10S



A148-3S



### Performance and Value Leaders

A148-10S and A148-3S are the newest computer optimized models of our 2 meter Yagis. We have improved both the pattern and gain of these antennas to give you better FM coverage. They have direct 50 Ohm Reddi-Match with SO239 connector and stainless steel hardware.

A148-3S is the low priced quality leader for Packet, FM or even portable use. It is easily rear mounted.

A148-10S is one of our best value designs with excellent gain and front-to-back ratio. Use it for long range FM or full band 2 meter operation.

For even higher gain the all new A148-20S is a complete antenna array with two ten element Yagis, stacking frame, harness and stainless steel hardware.

Model	A148-3S	A148-10S	A148-20S
Frequency, MHz	144-148	144-148	144-148
No. Elements	3	10	20
Forward Gain, dBd	7.8	13.2	16.2
Front to Back Ratio, dB	25	24	24
SWR 1.2:1 Typical			
2:1 Bandwidth, MHz	>5	≥4	≥4
Power Rating, Watts PEP	1000	1000	1000
3dB Beamwidth, Degrees			
E Plane	66	40	20
H Plane	108	46	46
Boom Length, ft (meters)	2.8 (.85)	12(3.6)	12 (3.6)
Longest Element, in (cm)	41 (104.1)	40.3 (102.4)	40.3 (102.4)
Turning Radius, ft (m)	2.8 (.8)	6 (1.8)	6.6 (2.0)
Mast Size Range, in (cm)	1.25-2.0 (3.2-5.1)	1.25-2.0 (3.2-5.1)	1.25-2.0 (3.2-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	0.27 (0.02)	1.21 (0.11)	2.82 (0.26)
Weight, lb (kg)	1.5 (0.7)	6 (2.7)	15 (6.8)

MODEL	A449-6S	A449-11S
Frequency, MHz	440-450	440-450
No. Elements	6	11
Forward Gain, dBd	10.5	13.2
Front to Back Ratio, dB	18	20
SWR 1.2:1 Typical		
2:1 Bandwidth, MHz	>10	>10
Power Rating, Watts PEP	350	350
3dB Beamwidth, Degrees		
E Plane	60	48
Boom Length, ft (m)	2.9 (0.89)	4.2 (1.35)
Longest Element, in (cm)	13 (33)	13 (33)
Turning Radius, ft (m)	2.9 (.89)	2.8 (.85)
Mast Size Range, in (cm)	1.25-2.0 (3.2-5.1)	1.25-1.5 (3.2-3.8)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	0.30 (0.03)	0.39 (0.04)
Weight, lb (kg)	3 (1.4)	4 (1.8)

### Stacking Kits

Our VPK stacking kits for the antennas above are supplied complete with mounting boom, harness, and hardware.

Antenna	Frequency MHz	Complete Kit	Harness Only
A148-3S	144.5-148	A14-VPKS	A14-SK
A148-10S	144.5-148	A148-VPKS	A148-SK
A449-6S	440-450		A449-SK
A449-11S	440-450	A449-VPKS	A449-SK



## 70 CM, 2 Meters



Reliable satellite communications will be yours with the new Cushcraft OSCAR antennas. The new 22XB two meter and 738XB 70 cm circularly polarized Boomer antennas offer the flexibility you need. Buy them both to create the best station possible or use a single antenna to upgrade an existing installation. Cushcraft provides polarization switches with both antennas. There are no additional options needed. Each antenna includes complete instructions on the mounting and installation of your OSCAR antenna system.

### NEW 22XB 2M OSCAR

Stronger signals will link your station with the satellite of your choice. Cushcraft's new 22XB OSCAR Boomer gives you the excellent performance that hams around the world have experienced with the Boomer antenna series. Clean patterns, 14 dBdc gain, superb circularity, and rugged construction are all part of the package. The polarity relay to switch from right to left circular polarization is included. These new designs are resistant to changes brought about by the weather. Construction of the 22XB features all stainless steel hardware. The boom is an extra rugged 1-1/2" diameter 6063-T832 aluminum alloy. Aim your new 22XB at the satellite and you'll be enjoying OSCAR at its best.

### NEW 738XB 70 CM OSCAR

Computer aided design and superior engineering are combined to make 738XB the finest 70 CM OSCAR antenna available. The longer boom means more gain. Thirty-eight optimally spaced elements on a rugged 14.3 foot boom mean 15.5 dBdc of gain for your station. Easily overcome the QRM and be on your way to more successful QSO's. Excellent ellipticity means that as the satellite rotates your signals will stay steady. Cushcraft's 738XB features a built-in polarity switcher. All stainless steel hardware, the rugged 6063-T832 aluminum boom, and the weather-sealed polarity switch all add up to the best choice for the serious OSCAR operator. Assemble a winning station by choosing Cushcraft satellite antennas.



**738XB**



**22XB**

MODEL	22XB	738XB
Frequency, MHz	144-148	432-438
No. Elements	22	38
Forward Gain, dBdc	14	15.5
Front to Back Ratio, dB	25	25
Ellipticity dB at boresight	2	2
SWR 1.2:1 Typical		
2:1 Bandwidth, MHz	4	6
Power Rating, Watts PEP	600	250
3dB Beamwidth, Degrees		
E Plane	30	24
Boom Length, ft (m)	19.33 (5.9)	14.33 (4.37)
Longest Element, in (cm)	39.19 (99.6)	13.94 (35.4)
Turning Radius, ft (m)	11 (3.35)	8.5 (2.6)
Mast Size Range, in (cm)	1.5-2.0 (3.8-5.0)	1.5-2.0 (3.8-5.0)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	2.6 (.24)	1.4 (.13)
Weight, lb (kg)	11 (5)	7.6 (3.5)
Polarity switch	Included	Included

### NEW A148-20T 2 Meter Hi-Lo Cross Yagi

Here's the antenna that solves multi-mode problems! Ten vertically polarized and ten horizontally polarized elements provide 11.1 dBd gain covering 144-148 MHz. The horizontal elements handle your CW and SSB needs, while the vertical elements cover FM. Hardware is stainless steel.

A148-20T has a boom length of 11 ft. (3.4m), longest element length of 40.6 in. (103cm), wind area of 1.21 ft<sup>2</sup> (.11m<sup>2</sup>), and a mast size of 1.25-2 in. (3.2-5.1 cm).



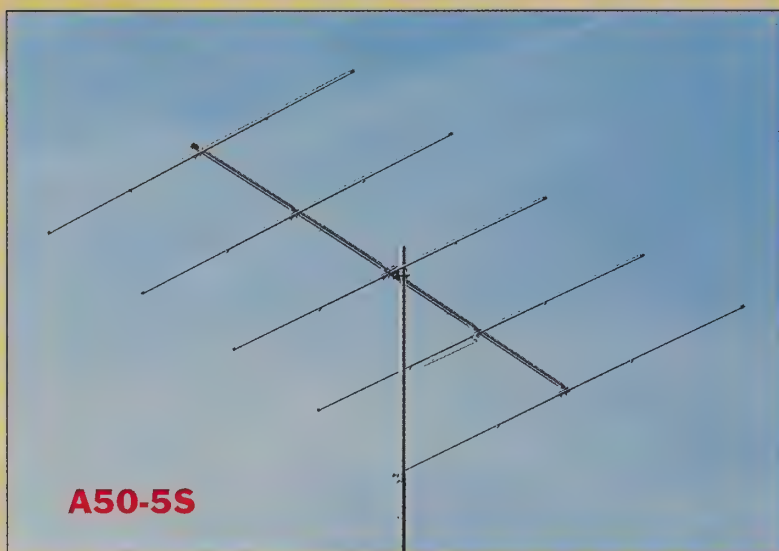
**A148-20T**



## 70 CM, 2, 6 Meters



**A50-6S**



**A50-5S**

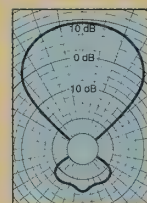


**A148-10S**

### 6 Meters

Computer-aided modeling and test range techniques were used by Cushcraft engineers to further optimize the performance of our popular 6 meter Yagis. This process means more gain and cleaner patterns with excellent front-to-back ratios. S-models have very broad bandwidth so they will not detune in bad weather. They feature stainless steel hardware for long trouble-free life. Enjoy the new popularity and exciting contacts on the 6 meter band with one of the S-series Cushcraft Yagis.

MODEL	A50-3S	A50-5S	A50-6S
Frequency, MHz	50-54	50-54	50-54
No. Elements	3	5	6
Forward Gain, dBd	8	10.5	11.6
Front to Back Ratio, dB	20	24	26
SWR 1.2:1 Typical			
2:1 Bandwidth, MHz	>1	>1	>1
Power Rating, Watts PEP	1000	1000	1000
3dB Beamwidth, Degrees			
E Plane	76	56	48
Boom Length, ft (m)	6 (1.8)	12 (3.7)	20 (6.1)
Longest Element, in (cm)	117 (300)	123 (312)	119 (302)
Turning Radius, ft (m)	6 (1.8)	7.8 (2.37)	11.5 (3.5)
Mast Size Range, in (cm)	1.5-2 (3.8-5.1)	1.5-2 (3.8-5.1)	1.5-2 (3.8-5.1)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	1.80 (0.17)	2.9 (0.273)	4.46 (.41)
Weight, lb (kg)	7 (3.2)	11 (5.0)	18 (8.2)



A50-6S  
RADIATION  
PATTERN

### 70 CM / 2 Meters

A148-10S is the latest generation of our incredible 2 meter Yagis. With its computer optimized design it has outstanding gain and pattern. This antenna is for SSB, CW, tropo or any mode. It has all stainless steel hardware and SO-239 connector. Assembly is quick with easy-to-follow instructions.

For 70 cm, the always popular A430-11S has been re-designed with all stainless steel hardware.

MODEL	A144-7S	A148-10S	A430-11S
Frequency	144-146	144-148	430-435
No. Elements	7	10	11
Forward Gain, dBd	11.1	13.2	13.2
Front to Back Ratio, dB	20	24	20
SWR 1.2:1 Typical			
2:1 Bandwidth, MHz	>3	≥4	>10
Power, Watts PEP	1000	1000	350
3dB Beamwidth, Deg.			
E Plane	46	40	38
H Plane		46	
Boom Length, ft (m)	8.2 (2.5)	12 (3.6)	4.7 (1.40)
Longest Element, in (cm)	40 (101.6)	40.3 (102.4)	14 (35.5)
Turning Radius, ft (m)	4.9 (1.5)	6 (1.8)	2.6 (.81)
Mast Size Range, in (cm)	1.5-2 (3.8-5.1)	1.25-2.0 (3.2-5.1)	1.25-1.5 (3.1-3.8)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	0.81 (0.08)	1.21(0.11)	0.42 (.04)
Weight, lb (kg)	4 (1.8)	6 (2.7)	3 (1.4)



### Fast Acting Gas Discharge Lightning Arresters

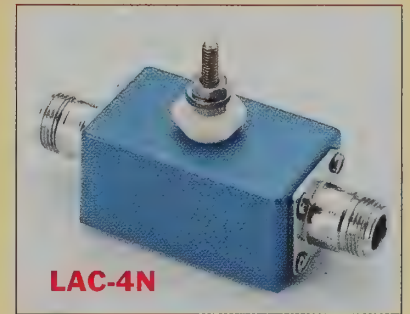
Protect your valuable equipment from surges of up to 5,000 amperes with a Cushcraft constant impedance LAC4 arrester! The LAC4 has a replaceable gas discharge tube which clamps voltage surges to less than 50 volts in about 100 nanoseconds—much quicker than the voltage rise time of lightning.

You cannot afford to be without lightning protection. One of the models below is right for your shack.

- LAC4 200 Watt with UHF SO-239 connectors
- LAC4H 2 kW with UHF SO-239 connectors
- LAC4N 200 Watt with N connectors
- LAC4NH 2 kW with N connectors
- LC2 200 Watt replacement cartridge
- LC2KW 2 kW replacement cartridge



**LAC-4H**



**LAC-4N**



**LAC-1**



**LAC-2**

### Blitz Bug Lightning Arresters

Cushcraft also recommends this well-known series of arresters which are based on a patented three point static discharge design. The Blitz Bug has a sealed air chamber, constant static drain, and controlled voltage discharge.

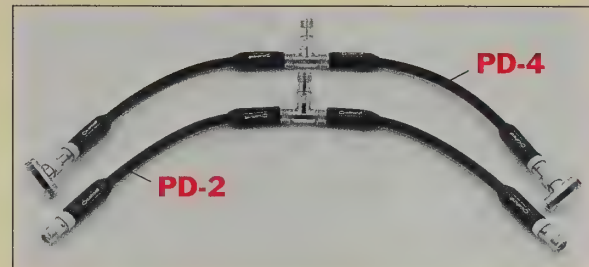
The Blitz Bug is rated at 2 kw PEP to 500 MHz with negligible insertion loss.

- LAC-1 with UHF PL-259 and SO-239 connectors
- LAC-2 with UHF SO-239 connectors

### Power Dividers For Boomers

Our power dividers make it a snap to stack Cushcraft Boomers. Models for 17B2 have N-connectors. They are available for these antennas:

- PD-2 for two 13B2, 124WB
- PD-2N for two 17B2
- PD-4 for four 13B2
- PD-4N for four 17B2
- PD-222 for two 220B, 224WB or 225WB
- PD-224 for four 220B, 224WB or 225WB



### Stacking Harnesses For Boomers

For even easier installation of our Boomers, use our installation kits that are complete with harness and power divider. Models for 17B2 have N-connectors.

- 617-SK for two 617-6B's
- 22-SK for two 13B2's
- 22N-SK for two 17B2's

One year warranty backed by our 40 years of antenna experience.

Cushcraft antennas are designed to survive 80 mph (129 kph) winds.

For safe antenna installations, avoid contact with powerlines.

The use of lightning arresters is highly recommended.

Stainless steel hardware and high grade seamless 6063-T832 tubing used in all antennas.

Support mast, feedline and RF chokes are not included with antennas.

Specifications are subject to change without notice.

All Cushcraft antennas are available through dealers worldwide.

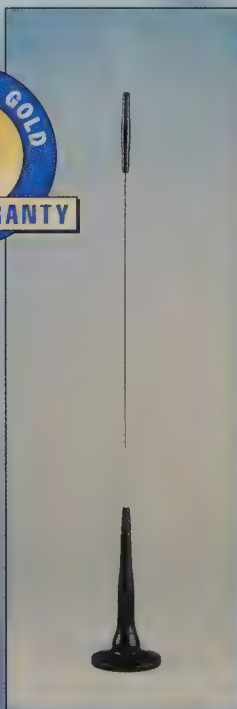
### BOOMER STACKING INFORMATION

Antenna	2x617-6B	2x13B2	4x13B2	2x220B	4x220B	2x424B	4x424B	2x17B2	4x17B2
Forward Gain, dBd	17.0	18.8	21.8	19.8	22.4	20.8	23.4	21.0	24.0
Front/Back Ratio	30	24	24	30	30	30	30	24	24
E-Plane Beamwidth, deg	2x17.5	2x18	2x9	2x13	2x6.5	2x9.5	2x4.8	2x14.5	2x7.3
H-Plane Beamwidth, deg	2x10	2x9.5	2x9.5	2x7	2x5.5	2x5.5		2x7.5	2x7.5
Vert, ft	26	9.2	9.2	8	8	5	5	11.5	11.5
(m)	7.92	2.8	2.8	2.44	2.44	1.97	1.97	3.5	3.5
Horiz, ft	-	-	9.6	-	8.5	-	5.5	-	12
(m)	-	-	3.0	-	2.59	-	2.16	-	3.7
Approximate Wt, lb	62	22	44	23	76	15	55	32.5	115
(kg)	28.12	10.00	20.00	10.40	34.40	7.62	24.95	14.8	52.3



# ANTENNA LOCATOR CHART

DESCRIPTION	POPULAR MODES				BANDS OF OPERATION												PAGE
	SSB	CW	FM	PACKET	80	40	30	20	17	15	12	10	6	2	1.25	0.7	
HF halfwave R7000 (w/R80 kit)*	●	●			*	●	●	●	●	●	●	●					1
HF tri-band Yagis & 5 band Log	●	●						●	●	●	●	●					2, 3
HF add-on kits	●	●				●	●										2
HF rotatable dipoles	●	●				●	●	●	●	●	●	●					3
HF quarterwave verticals	●	●			●	●	●	●	●	●	●	●					4
HF monoband Yagis	●	●				●		●		●		●					5,6
VHF Boomer Yagis	●	●		●									●	●			7, 8
VHF-UHF Boomer Yagis	●	●												●	●	●	7, 8
VHF-UHF FM Boomer Yagis			●	●										●		●	8, 9
VHF-UHF dual band antennas			●	●										●		●	10, 11
HF-VHF-UHF verticals			●	●								●	●	●	●	●	10, 11, 13
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HF-VHF-UHF mobile mounts													●	●	●	●	12
Boomer stacking information																	17



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E-mail: hamsales@cushcraft.com • World Wide Web: <http://www.cushcraft.com>



## Spider™ HF Mobile Antenna

Of the several HF mobile antennas on the market, most of them operate on a similar principle. A 4- to 5-foot-long mast attaches to the mounting point, and then some sort of loading coil or resonator goes on top of the mast, with an adjustable-length whip above the loading coil. Different loading coils, or resonators, allow operation on the various bands. Several resonators can be mounted on the mast, eliminating the need to stop the car and jump out to change bands. Many of the commercial mobile antennas come with a multiband adapter.

So what is different about the Spider antenna? This antenna uses a unique type of loading coil, or resonator. Tuning within a band is accomplished by sliding a plastic-coated tuning sleeve along the side of the resonator. There are no electrical connections between the tuning sleeve and the coil. A logging scale is provided on each resonator to index the position of the tuning sleeve. With a simple chart of resonant frequency as a function of logging scale, the antenna can be adjusted to resonance at any frequency within the band. There is no whip above the resonator.

The antenna is supplied with resonators for 40, 20, 15 and 10 meters. The optional 80/75-meter resonator was included with the review antenna. If you already have a 1/2-inch mobile antenna mast, then you may need only the Spider adapter that permits installation of the Spider resonators at the top of your mast.

### Mounting the Antenna

The instructions provide little information about mounting the Spider antenna on a vehicle. I have a van and did not want to use the conventional bumper-mounting method. I was intrigued by the picture in the Spider ads that show it mounted on the front cowl of a van. I have some fairly strong opinions about how a mobile antenna should be mounted. Some of those opinions come from personal experience with mobile antennas, and some come from my knowledge of mechanical construction and antenna principles. Certainly, there are people who do not agree with me or who would not want to follow my suggestions.

A few years ago, I picked up a second-hand mobile antenna for a few dollars at a hamfest. I attached the mast to a bumper mount on my station wagon and soon learned the joys of HF mobile hamming. After about a month, to my dismay, the antenna mast would no longer stay on my car! It seems that the swaying action of the antenna as I drove along had torn the threads out of the bottom of the mast. The antenna was useless. I learned the hard way about using a heavy-duty spring at the base of the mast so as to allow it to sway and not damage the mounting threads.

People have told me that it is not necessary to use a spring at the base of the mast. One person even went so far as to explain how he

visited his friendly, local machine shop when the threads tore out of the bottom of his antenna mast. The machinist was able to enlarge the hole, tap new threads and then install an adapter for the standard 3/8-24 mounting stud. Every few months he would go back to the machinist to have a new adapter installed. Like I said, use a heavy-duty spring at the base of the mast! If you don't think having the antenna sway will damage the mast, just wait until you hit a low-hanging tree branch at 30 mi/h or so!

Of course, the spring will bend as you drive down the highway. In fact, the antenna can bend over quite far, and become a rather serious hazard. The simplest solution is to attach one or two nylon or twine guys near the top of the antenna, and then tie the guy lines to some point on the car to prevent the antenna from bending too far backwards or to the sides as you drive. A roof rack or rain-gutter clips make good attachment points for fastening the guys to the car.

Back to the problem of mounting the Spider on my van. While the instructions made no mention of using a spring and the ad picture does not show one, I wanted to use a spring. By mounting the antenna on the cowl, I couldn't attach guy lines to keep the antenna from bending down along the side of the van. Ideally, a mobile antenna should be mounted in the center of the roof, but I sure didn't want to add 6 1/2 feet to the height of my van! You probably don't want to add that much height to your car, either! The trunk lid or rear bumper are good places to mount a mobile antenna on a car, but not so good on a van. I finally settled on a spot near the top of the rear side panel, and installed a ball mount for the antenna. In this location, I can guy the antenna to the front roof rack to keep it from bending back and

to the far side of the rear roof rack to keep it from swinging over onto the sidewalk or slower traffic lane. By pulling on the front guy, I am able to fold the antenna forward to lay along the roof if there is a low overhead clearance.

For mounting the Spider on a car, a standard bumper mount should work fine. If you mount it on a full-size station wagon, consider putting the antenna near the top of one side panel, or perhaps even on the roof.

In either case, you should have less of a problem determining a suitable mounting location than I did.

If you live in a location where you cannot erect some other type of antenna, the Spider antenna can be used in an apartment or fastened to the metal railing on a patio or porch. With a few radials to form a ground plane, the Spider should serve well as your main station antenna. The instructions that come with the antenna give some details on this type of installation.

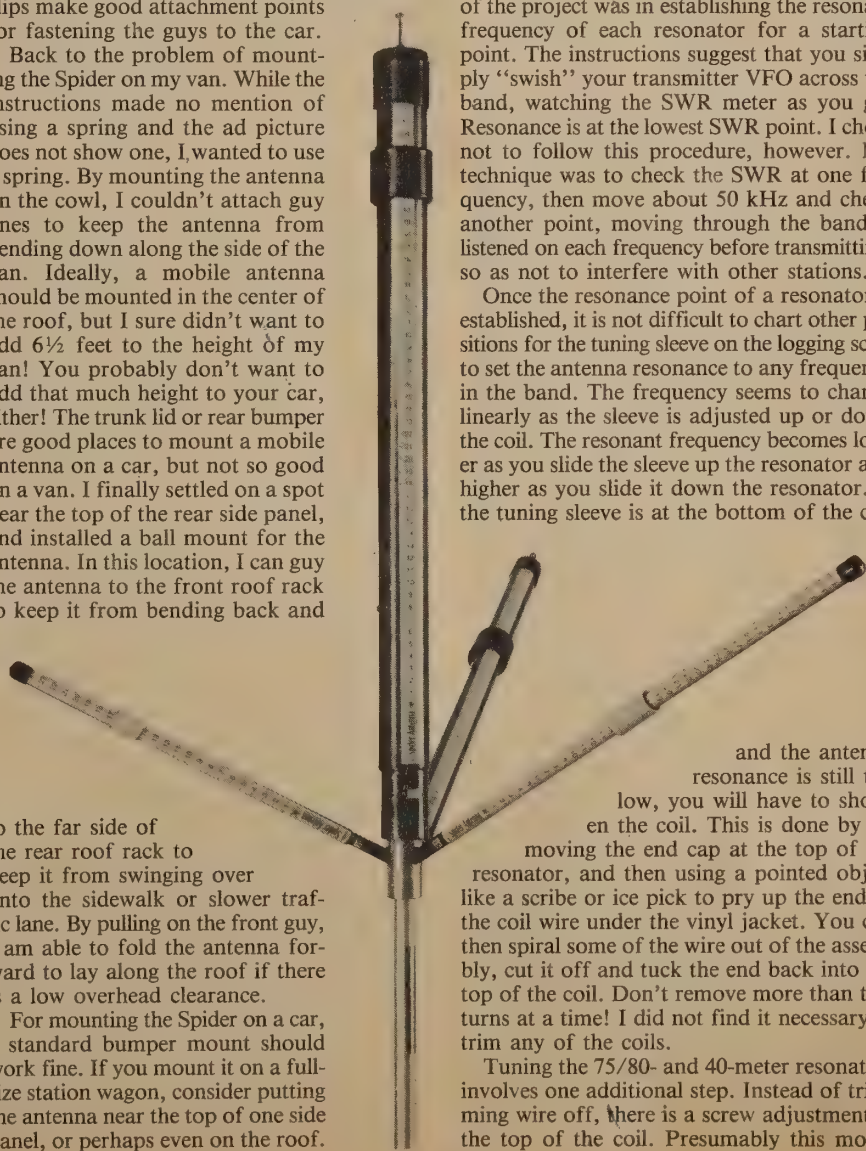
### Tuning the Antenna

I spent about an hour and a half making up tuning charts for the various bands. The procedure is rather simple, although it is time consuming if you have to get in the car, adjust the transmitter, read the SWR, then get out and move the tuning sleeve on the resonator. Most of the time I spent on this part of the project was in establishing the resonant frequency of each resonator for a starting point. The instructions suggest that you simply "swish" your transmitter VFO across the band, watching the SWR meter as you go. Resonance is at the lowest SWR point. I chose not to follow this procedure, however. My technique was to check the SWR at one frequency, then move about 50 kHz and check another point, moving through the band. I listened on each frequency before transmitting, so as not to interfere with other stations.

Once the resonance point of a resonator is established, it is not difficult to chart other positions for the tuning sleeve on the logging scale to set the antenna resonance to any frequency in the band. The frequency seems to change linearly as the sleeve is adjusted up or down the coil. The resonant frequency becomes lower as you slide the sleeve up the resonator and higher as you slide it down the resonator. If the tuning sleeve is at the bottom of the coil

and the antenna resonance is still too low, you will have to shorten the coil. This is done by removing the end cap at the top of the resonator, and then using a pointed object like a scribe or ice pick to pry up the end of the coil wire under the vinyl jacket. You can then spiral some of the wire out of the assembly, cut it off and tuck the end back into the top of the coil. Don't remove more than two turns at a time! I did not find it necessary to trim any of the coils.

Tuning the 75/80- and 40-meter resonators involves one additional step. Instead of trimming wire off, there is a screw adjustment in the top of the coil. Presumably this moves





system described in reference 4 can be used. For triode amplifier ALC circuits, see reference 5.

## Circuit Description

This circuit can be universally applied. Circuit variations depend only on the bias voltages used, not on the tube type. The circuit for bias-voltage levels such as those used with the 4CX1000A is shown in Fig 1. Grid current is sampled by R1, which acts somewhat like a meter shunt; the voltage developed across R1 turns on Q1. Approximately 0.1 mA of grid current is required to develop the 0.6 V needed to forward bias the base-emitter junction. With Q1 on, the operating bias voltage,  $E_0$ , appears at the collector of Q1. The voltage at the emitter of Q2 is derived from a more negative point,  $E_1$ . The difference between  $E_1$  and  $E_0$  appears across R3, and the resulting current turns on Q2.  $E_1$  then appears at the collector of Q2. The Zener diode, D3, in the output line reduces this voltage to a level that is comfortable for the exciter. The transistor types used for Q1 and Q2 are not critical. Q1 and Q2 are silicon PNP and NPN types, respectively, with voltage ratings above the level of the highest voltage in the circuit.

For class-C operation (with suitable tubes only), the ALC line is switched off and the amplifier is driven into high grid current. In this situation, protective diodes D1 and D2 in the input circuit limit the voltage drop across R1, and R2 then limits the Q1 base current. Isolating diode D4 in the output circuit ensures that there is no possibility of the amplifier ALC circuit loading the exciter circuits during barefoot operation. D4 also prevents any possible interaction between the different amplifier ALC circuits in my station, all of which are connected in parallel to the exciter ALC jack.

The voltage ( $E_0$ ) appearing at the collector of Q1 when it is turned on cannot be used directly for ALC. This is because without the higher negative voltage,  $E_1$ , to reverse bias the base-collector junction,  $E_0$  will appear at the collector at all times, even without grid current.

## Circuit Analysis

The important circuit components are R1 and R3. The value of R1 is not too critical; it is chosen as a compromise between the requirements of limiting the grid current to a low level and not introducing excessive resistance into the grid circuit. A value of 4.7 k $\Omega$  satisfies these requirements. I tried lower values of resistance at R1 for several years in one of my amplifiers, using a panel-mounted variable resistor to set the ALC level. No output power or distortion differences were noted using values of resistance between 500  $\Omega$  to 5 k $\Omega$ , corresponding to a grid-current range of from 0.1 mA to 1 mA. No deterioration of amplifier operation has resulted from the insertion of 4.7 k $\Omega$  in the grid lead.

The value of R3 plays a more important

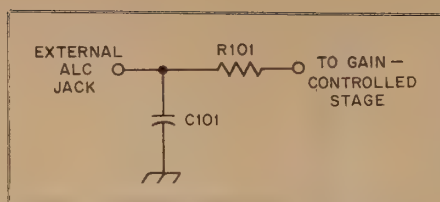


Fig 2—A typical exciter ALC input circuit.

role than may at first be apparent. An ALC circuit must act quickly at the first cycle of the first syllable of the voice signal to properly control the drive level. A typical exciter ALC input circuit is shown in Fig 2. We can insert no appreciable resistance in the collector of Q2 as this would cause a time delay in charging C101 in the exciter. On the other hand, we must prevent creating collector currents beyond the rating of Q2 while charging C101, or when the ALC cable is accidentally shorted (an uncharged C101 acts like a short). This is the role of R3; it is chosen to produce a 1-mA base current in Q2. This limits the collector current to a safe value with any typical transistor that might be used and still provides fast charging of C101 and a consequential quick ALC attack time. For example, if Q2 has a gain of between 20 and 100, the collector-current limit will be between 20 mA and 100 mA.

## Circuit Variations

The only circuit changes required for use with various amplifiers are the value of R3, the voltage ratings of the transistors and the output Zener diode ratings. D3 has a voltage rating of approximately 20 V less than  $E_1$ ; this allows a maximum of 20 V to reach the exciter. The value of R3, measured in kilohms, is numerically equal to the difference between the standby and operating biases,  $E_1$  and  $E_0$ , respectively. The exact value of R3 need only be approximate. Thus, a 4-400A amplifier with a 300-V standby bias and 150-V operating bias would use a 150-k $\Omega$  resistor at R3 and an output Zener diode (D3) rated at about 280 V. (Whatever Zener diodes you have in your junk box can be used to make up a series arrangement at roughly the desired voltage.) If screen-voltage switching is used for standby, the available bias supply voltage is used for Q2; this was called "standby bias" earlier for easy reference; any available voltage more negative than the operating bias will suffice. For example, an 8122 amplifier with screen standby control, and a constant 20-V operating bias, uses the 60-V bias supply at the emitter of Q3, a 39-k $\Omega$  resistor at R3 and a 39-V Zener for D3.

The output Zener has a value that is more psychological than electronic. One of my amplifiers worked for 10 years with no Zener without a bit of trouble—except an occasional worry. In fact, there is almost no way for the full bias supply voltage  $E_1$

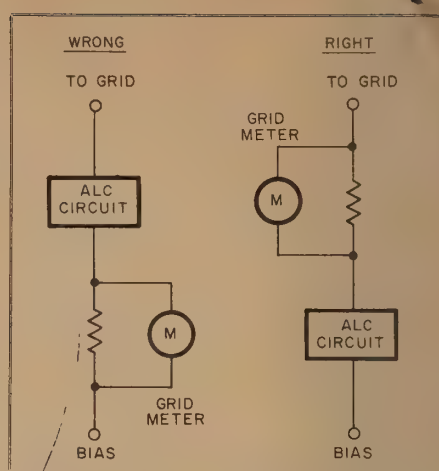


Fig 3—ALC circuit installation. See text.

to appear at the exciter. As soon as the ALC voltage rises far enough to limit the exciter gain so as to reduce the amplifier drive to the grid-current threshold level, the current in Q1, and the base current in Q2, are reduced so that Q2 will provide all the voltage drop required. However, D3 does provide protection for the exciter in the event of a short in Q2. Also, D3 reduces the dissipation in Q2. Since the circuit has been used only with an exciter whose ALC circuit requires less than 0.1 mA, the dissipation in Q2 has not been a problem. Usually R101 is fairly large; hence, there should be no dissipation problems. But if an exciter requires a significant amount of current, the dissipation in Q2 must be calculated.

It is easy to test the exciter by applying the required negative ALC voltage at the exciter ALC jack with a test supply and measuring the current required to swing the ALC meter. The required power rating for D3 can then be calculated. If a transistor with a higher dissipation rating is required for Q2, try an MPS-U10. At slightly higher cost, the high-quality 2N5416 and 2N3439 can be used for Q1 and Q2, respectively.

Although I haven't tried it, this circuit can be used for class-AB<sub>2</sub> operation. To obtain a higher grid-current threshold, simply decrease the value of R1.

## Installation

If the ALC circuit is installed in the wrong part of the amplifier grid circuit, the emitter-base current of Q2, supplied by  $E_1$  and returned through Q1 to the operating bias point at level  $E_0$ , will appear on the grid-current meter. To avoid this, the grid-meter shunt should be between the ALC circuit and the grid, as shown in Fig 3.

When the ALC circuit is installed in an existing amplifier, a handy retrofit method is to build the circuit on a small plug-in circuit board. In this case, it is best to per-

(continued on page 47)



# New Products

## PRINTED STRIPBOARDS FROM DICK SMITH ELECTRONICS

□ An assortment of sizes and configurations of printed stripboards is available from Dick Smith Electronics. Patterned after the popular English Veroboard, these versatile prototype and experimenter's boards provide etched copper strips predrilled on 0.1-in centers to allow mounting of ICs, DIP packages and discrete components. Copper strips are pretinned to facilitate easy soldering. When you wish to terminate a circuit, just cut the strip with a hobby knife or the special spot-face cutter available from DSE. Shown (l-r) are four sizes of stripboard, and at top center, the H-5606 design breadboard.

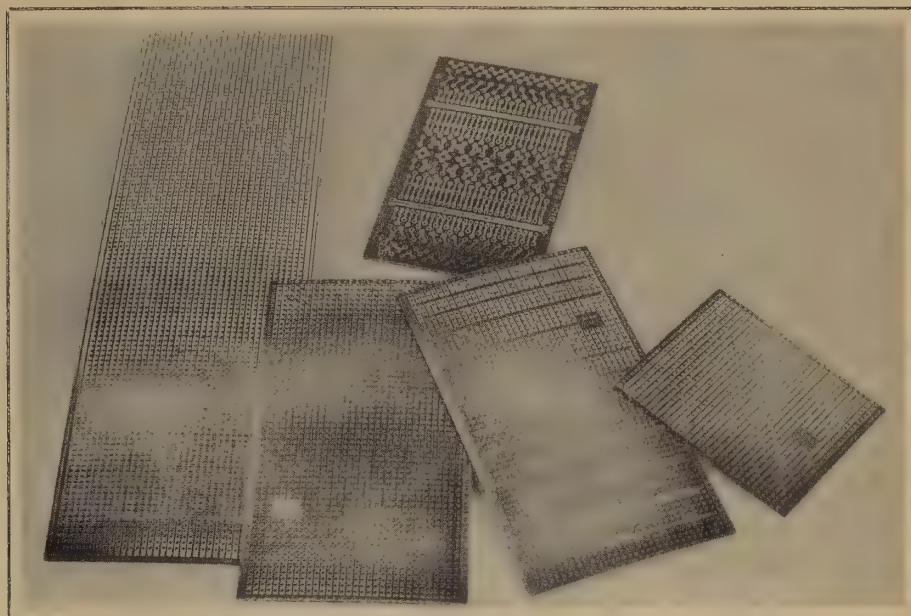
### Catalog

No.	Size	Price
H-5112	3 3/4 × 12 in	\$2.95
H-5612	3 × 6 in	\$1.50
H-5616	3 × 6 in	\$2.00
H-5614	3 × 3 in	\$1.00
H-5606	3 × 5 in	\$1.50

Available from Dick Smith Electronics, Inc., PO Box 8021, Redwood City, CA 94063, tel 415-368-8844. Send \$1 postage for the DSE catalog. The DSE catalog is unique in that there are 15 pages filled with hard-to-get information on pin connections for ICs, Zener-diode data, circuit ideas, transistor interchangeability data, and much more.—*Bruce O. Williams, WA6IVC*

## YAESU AD-2 DUPLEXER FOR THE FT-2700RH DUAL-BAND TRANSCEIVER AND FT-726R VHF/UHF ALL-MODE TRANSCEIVER

□ Yaesu Electronics has announced the new AD-2 Duplexer to provide semi- or full-duplex VHF/UHF crossband operation with a single 2-m/70-cm dual-band antenna. The single antenna may serve for



both transmitting on one band and receiving on the other band simultaneously. Band-to-band isolation of more than 50 dB assures minimum receiver interference between bands. At high power, up to 50 W, there is minimal insertion loss of either transmit power or receive sensitivity.

### Specifications

Passbands: 140-150 MHz and 400-500 MHz.  
Maximum power: 50 W.  
Insertion loss: VHF less than 0.3 dB, UHF less than 0.5 dB.  
Impedance: 50 ohms.  
SWR: Less than 1.2:1.  
Receive isolation: 50 dB.

For additional information contact your local Yaesu dealer or Yaesu Electronics Corp., PO Box 49, Paramount, CA 90723, tel 213-633-4007.—*Bruce O. Williams, WA6IVC*


## CURTIS 8044ABM KEYER CHIP

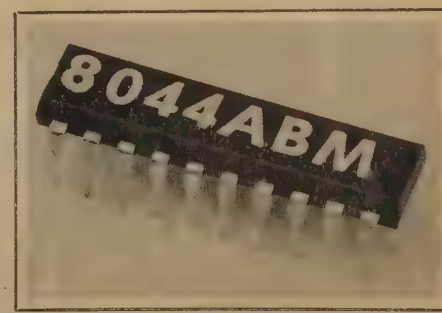
□ An enhancement of the popular 8044 keyer-on-a-chip has been introduced by Curtis Electro Devices. Called the 8044ABM, the CMOS device combines the functions of the 8044, 8044B, 8044M and 8044BM into one IC along with a new capability termed "negative weighting." Common keyer weighting circuits only add weight to dots and dashes by making them longer at the expense of spacing. By your switching a control on the 8044ABM, the weight control will either add or subtract from the code-element length. Negative weighting is useful in situations where the

transmitter is adding unwanted weight that must be cancelled.

The new IC also has a control line to switch the iambic keying action between the "B" method used in some keyers and the usual Curtis "A" method. (The B method adds an opposite element when a squeeze-keyer paddle is released during the generation of a code element; the original Curtis method adds nothing.)

Although *not pin compatible* with earlier Curtis IC versions, the 8044ABM retains all other properties of the 8044 series, including dot and dash memories, key debouncing, self-completing code elements, an instant-starting clock, a built-in sidetone oscillator, an analog speed indicator and extremely low power drain. Normally, the IC is operated from a 5- or 9-V dc source.

The 8044ABM is supplied in a 20-pin DIP plastic package and is priced at \$19.95. For further information, call or write to Curtis Electro Devices, Inc., Box 4090, Mountain View, CA 94040, tel 415-964-3846.—*Paul K. Pagel, N1FB* 





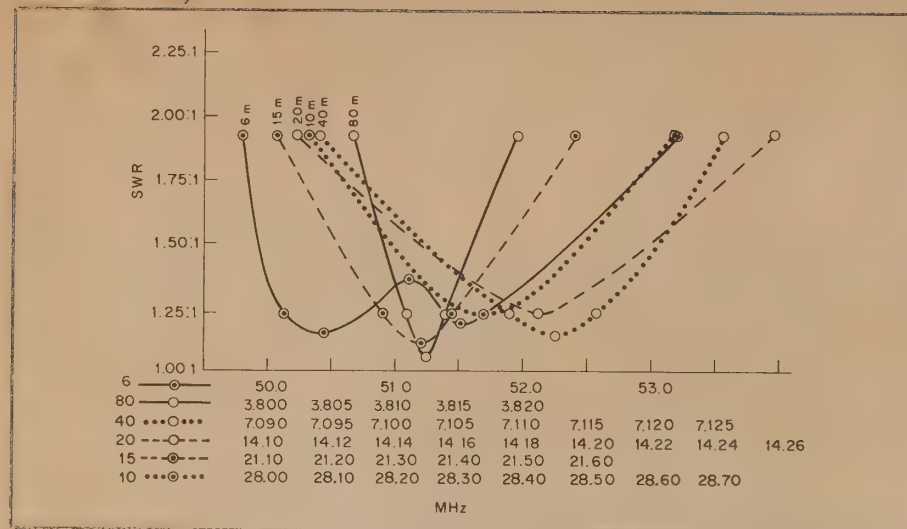


Fig 1—Plot of 80- through 6-meter SWR values calculated from return-loss measurements for the Spider antenna.

some type of core material into or out of the coil. To tune these, you start with the tuning sleeve at the bottom of the coil and your transmitter set near the high-frequency end of the band. The screw adjustment is used to set the high-end antenna resonance, and then moving the tuning sleeve up the coil will lower the resonant frequency.

### Operation

The basic operating principle of the Spider is not difficult to understand. The mast is like any mobile antenna, and the resonators take the place of the loading coil and the remaining portion of the whip. But how do those tuning sleeves, that appear to be nothing more than plastic-covered toroids, work? As the sleeve slides along the tuning coil, it effectively isolates the part of the coil above the sleeve from the rest of the antenna. The lower the sleeve on the coil, the shorter the effective length of the antenna and the higher the resonant frequency.

The idea of having more than one resonator on the antenna at the same time is based on the principle that the RF will be transmitted by the resonant antenna and be rejected by the nonresonant ones. There is always the possibility that a multiband antenna will radiate harmonics of the desired signal, if harmonics are present in the signal that is supplied from the transmitter. Modern commercial equipment is filtered well enough that this should not be a problem. If you are using a piece of homemade equipment, however, you should be certain that all harmonics are adequately filtered out of the transmitted signal.

### Construction

The Spider mast is made of solid 5/8-inch-diameter aluminum. At the top of the mast is a 1-inch-diameter section of aluminum with three resonator-mounting holes positioned 120° apart. The hole for a fourth resonator is in the top of this adapter. The bottom of the mast is also a 1-inch-diameter section of aluminum with a standard 3/8-24 mounting stud. This bottom section has three setscrews to hold the mast in position. By loosening these screws, you can rotate the mast to position the resonators after the mast is attached to your vehicle.

The 80-meter resonator outside diameter is just under 2½ inches, the 40-meter resonator is slightly less than 1 inch, and the 20, 15 and 10-meter resonators are each just under ½ inch. The higher-frequency resonators use thin-walled fiberglass tubing. The top of the fiberglass tubing is open, with an end cap to seal out moisture. The low-frequency resonators seem to be made from an acrylic tubing with both ends of the tubing plugged with pieces of plastic for strength and to help seal out the weather. The mounting stud is sealed into the fiberglass. The resonator form is covered with a tightly wound coil of approximately no. 18 copper wire. The entire assembly is covered with a heavy-duty plastic similar to heat-shrink tubing. A clear plastic coating covers the logging scale.

As I learned the first day I had the antenna on my van, the coil wire is attached to the mounting stud by running it through a hole drilled in the stud and soldering them together. While this makes an excellent electrical connection and simplifies construction, it may also weaken the mounting stud. When I stopped at a stop sign, the motion of my van caused the antenna to swing forward. To the best of my knowledge, the antenna did not hit anything, yet the 40-meter resonator snapped off at the base, right at the hole for the wire. (That's how I discovered the method of attaching the wire!) I had no problems with a replacement resonator, and have driven many miles with the antenna on my van.

Later, I also learned that the coil wire is passed through a hole in the fiberglass on the smaller resonators. I had the antenna folded down along the roof of the van with the 20-meter resonator straight up in the air. There is a possibility that I may have hit a low-hanging tree branch, but I am not positive. At any rate, I noticed that the 20-meter resonator was bent toward the back of the van. Further investigation revealed that the fiberglass had cracked, right at the hole that the wire passes through.

### Operating Impressions

After spending the time to make some tuning graphs so that I could set the antenna resonators for operation at almost any desired frequency, it was a pleasure to use this antenna for mobile operation. While the antenna band-

width is rather narrow on 80 and 40 meters, I could cover a sizeable piece of the higher-frequency bands without retuning the antenna.

Anyone who has ever tried HF mobile operation knows the joy of driving along the highway and chatting with a fellow ham hundreds, or thousands of miles away! The miles pass all too quickly when you get into a good rag-chew with a ham on the other side of the country. I had many enjoyable QSOs with stations in California, Texas and Midwestern states using the Spider. During one trip to Pennsylvania, I checked into the East Coast Amateur Radio Service (ECARS), chatted with the net control station and listened to other check-ins. When I asked for signal reports, a number of stations responded. While no one told me I had the loudest signal on the band, they could hear me with little or no difficulty.

To make the SWR plots shown in Fig 1, I used the spectrum analyzer from the ARRL Lab to make return-loss measurements. The tracking generator produces a signal that sweeps a wide range of frequencies, and a directional coupler is used to pick up the signals that are reflected from the antenna for the spectrum analyzer input. In this way, you can see a display of the antenna response to a range of frequencies and easily determine both the resonant frequency and the impedance match of the antenna.

If the signal returned to the analyzer is 10 dB or more below the tracking generator output, the SWR is 2:1 or better. If the returned signal is 20 dB less than the generator output, the SWR is 1.2:1 or better. By recording the return loss for a range of frequencies in each band, I produced the SWR curves shown. These curves are only for one setting of the tuning sleeve in each band, and so they give an idea of the possible frequency range.

Using this test setup, I discovered an interesting antenna resonance in the 6-meter band. I made no effort to tune the 6-meter response, and it is possible that it occurred because of something in my installation. I decided to include the curve with the other information of Fig 1 because it might be worth further investigation for someone interested in 6-meter mobile operation.

The Spider antenna is rated for use with transmitters of up to 200-W output. My Heath HW-5400 is rated for half that, and I made no attempt to put the rated power into the antenna. The antenna is not designed for operation at 1500 W, so don't plan to use it with an amplifier.

I had some problems with the antenna, but most of those were related to the vehicle I used, and the fact that I mounted it near the top of my van so the top of the antenna was at least 11 feet above the ground. If you mount the antenna on the bumper, or even the trunk lid of a car, you should not have those problems. If you are looking for a mobile antenna that is designed to operate on any one of up to four bands while you drive down the highway, consider the Spider antenna. If you need a simple, easy-to-mount antenna for apartment or other "base" operation, then this may be the antenna for you, too.

The Spider antenna is available only from Multi-Band Antennas, 7131 Owensmouth Ave, Suite 363C, Canoga Park, CA 91303, tel 818-341-5460. Price class: Antenna mast with 40, 20, 15 and 10-meter resonators, \$140; 80-meter resonator, \$38; adapter with 40-through 10-meter resonators for use with your existing mast, \$83.—Larry D. Wolfgang, WA3VIL





# Operation Manual

## Model CA-2x4ZC

### Highest Gain Dual Band COMMERCIAL Base Station Antenna

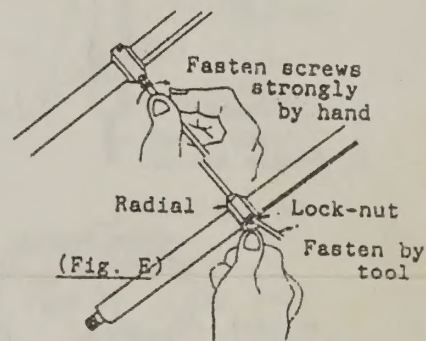
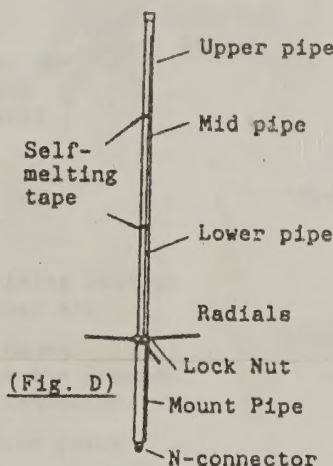
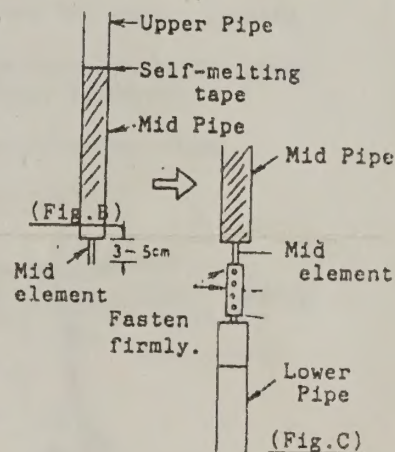
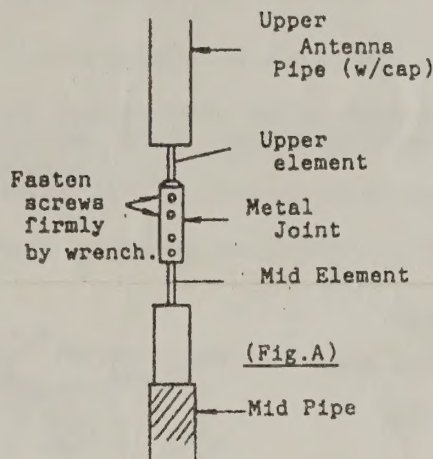
Super Linear Converter (SLC-system) realized highest gain dual bander for 153 & 465MHz, providing wide band and low SWR. No frequency adjustment is required. Everlast, heavy duty fiberglass construction. Lightening protection is equipped sufficiently.

#### Specifications :

Frequency	: 152-154MHz/8.2dB
Gain	: 461-469MHz/11.5dB
Impedance	: 50 ohm
V.S.W.R.	: Less than 1.5
Max Power	: 200 watt
Length	: 4.85 m
Weight	: 2.36 kg
Available mast dia.	: 30-62mm
Connector	: N-type

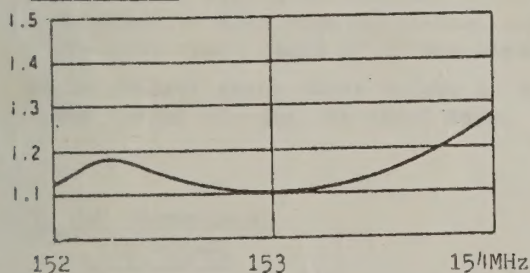
#### Assembling & Mounting :

- First, joint Upper & Mid elements. Lock screws firmly by the hex wrench. (Fig.A)
- After above jointing works, pull out such antenna element by 3-5cm lower than the end of mid-antenna pipe. Then, joint Upper and Mid Pipes. Pipe joint part must be completely waterproved by the attached self-melting tape. (Fig. B, C)
- Joint mid and lower elements, then, mid and lower pipes, as done in A and B. (Fig. D shows the complete figure.)
- Mount 3 radials. Lock nuts are to be fastened strongly by the tool. (Fig.E)
- Then, mount the whole antenna to the mast, with bracket, U-bolts, spring washers and nuts. (Fig. F.)

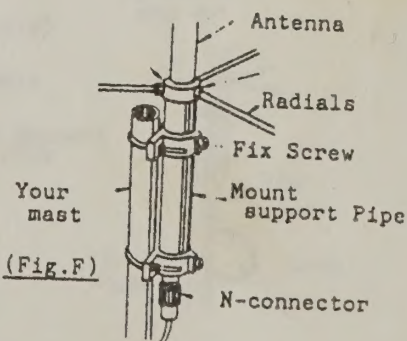
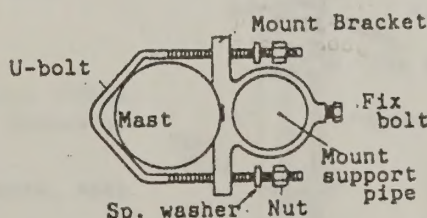
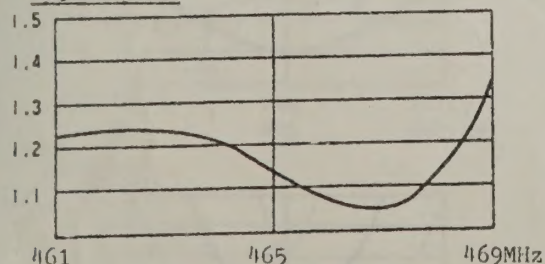


#### V.S.W.R. Characters :

##### 153MHz Band

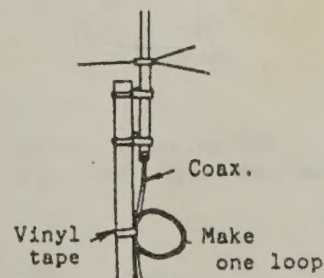
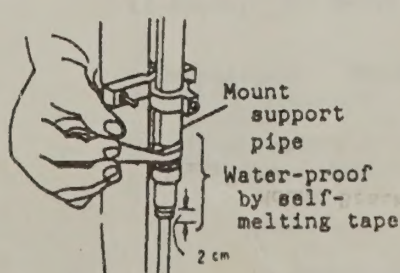


##### 465MHz Band



#### Remarks:

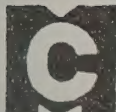
- CA-2x4ZC is high gain dual bander. In order to keep its high electrical quality, please use low loss coax. cable of 50 ohm standard.
- Joint part of coax. and antenna must be water-proved by self melting tape.
- To prevent extra heavy weight to the antenna, please make one circle of coax. by vinyl tape.











## Operation Manual

### Model CX-725

## World First Tri-Bander Base Antenna for 50, 146, 445MHz

### Features:

- 1) COMET SLC-system (super linear converter) could realize low-loss, wide band Tri-bander Firstly in the world.
- 2) One piece, heavy duty fiber glass is strong against wind, and is complete water/pollution proof.
- 3) Extremely wide band antenna at each frequencies, which requires No Frequency Adjustment.
- 4) Lightening protection guards your transceivers.
- 5) The additional use of COMET Triplexer CFX-514, 514J or 5140 allows Triplex(3-bands) TX/RX communication at the same.
- 6) The center frequency of 50MHz can be changed, adjusting the length of the radial.

### Specifications:

#### Frequency & gain :

50- 52MHz 2.15dBi

146MHz 6.2dB

445MHz 8.4dB

Impedance : 50 ohm

V.SWR : Less than 1: 1.5

Max. Power : 200 watt

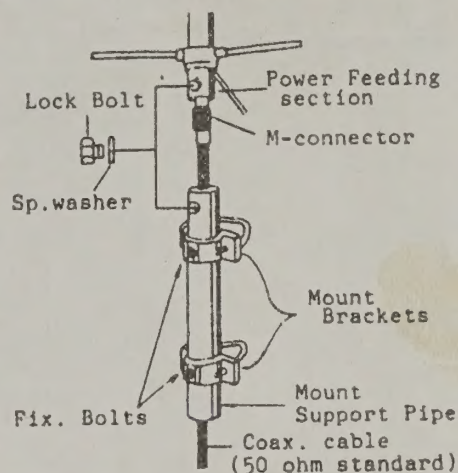
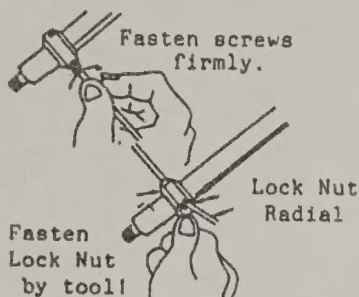
Length : 2.43 m

Weight : 1.33 kg

Connector : M (SO239) type

Pole dia. : 30 - 62 mm  $\phi$

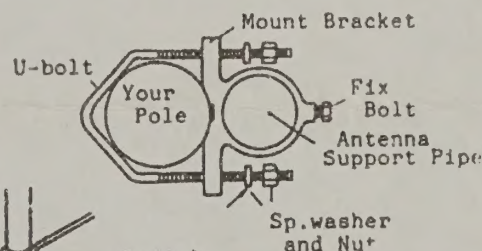
Wind Velocity : 50m/sec.



### Assembling Works:

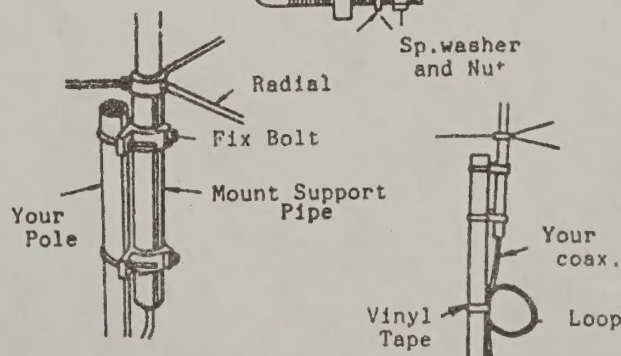
(Please refer to the right figs.)

- 1) Please assemble 3 radials to the Power Feeding Section. Then, lock them with Lock Nuts, using Spa nner etc.
- 2) Assemble and fix 2 Mount Brackets to the Mount Support Pipe. Pass your coax. cable through the Support Pipe and assemble it to the Antenna M-type connector.
- 3) Please use self-melting tape on the connector joint part, for complete water-proof.
- 4) Finally, mount whole assembly onto your Pole.

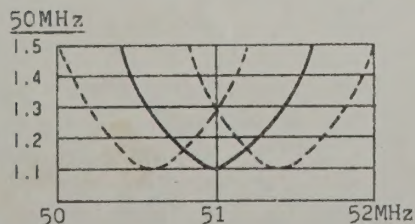
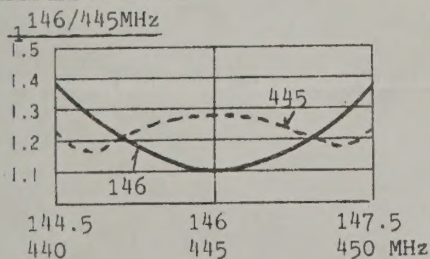


### Remarks:

- a) CX-725 is high gain 3-bander including high 445MHz. In order to keep high electrical quality, please use low loss coax. cable of 50 ohm standard.
- b) To prevent extra heavy weight to the antenna, make one circle of coax. by vinyl tape.

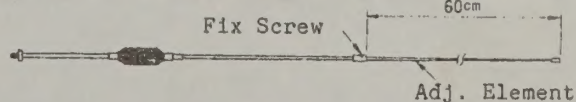


### V. SWR Characters:

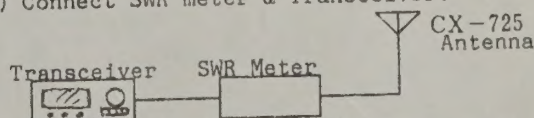


### How to adjust center freq. of 50MHz.

- 1) Set the length of adj. element at 60cm.



- 2) Connect SWR meter & Transceiver.



- 3) Adjust length of the element, watching SWR  
SWR Meter: lower freq-longer and higher-shorter.



